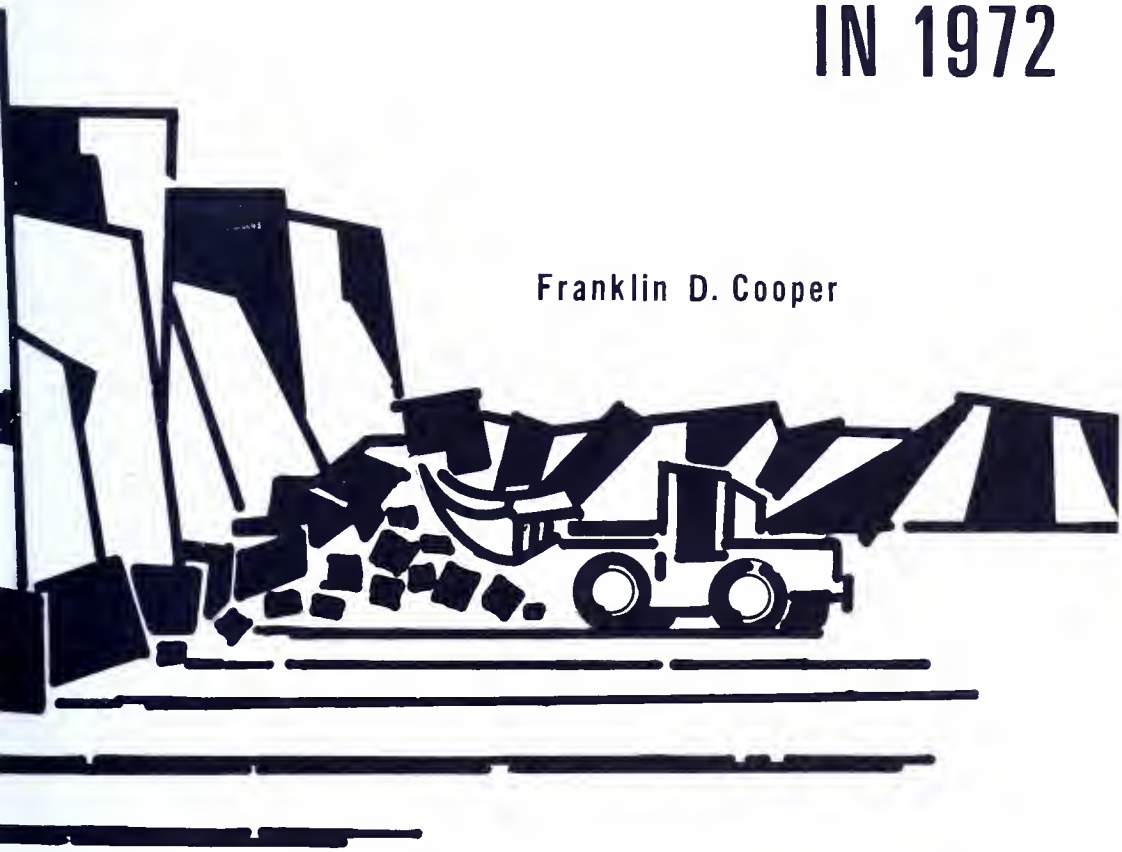
No. 78

Information Circular 78

1975

THE MINERAL INDUSTRY OF PENNSYLVANIA IN 1972

Franklin D. Cooper



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF
TOPOGRAPHIC AND GEOLOGIC SURVEY
Arthur A. Socolow, State Geologist

JUN 3 1975

Digitized by the Internet Archive
in 2016 with funding from
This project is made possible by a grant from the Institute of Museum and Library Services as administered by the Pennsylvania Department of Education through the Office of Commonwealth Libraries

https://archive.org/details/mineralindustryo00coop_1

The Mineral Industry of Pennsylvania

This chapter has been prepared by the Bureau of Mines, U.S. Department of the Interior, and the Pennsylvania Bureau of Topographic and Geologic Survey, Department of Environmental Resources, under a cooperative agreement for collecting information covering the mineral production from mines, quarries, and wells.

By Franklin D. Cooper [1]

Pennsylvania mineral production reached a record output value of $1,231.5 million, $82.4 million above that of 1971. Increases in value were attained by cement, clays, bituminous coal, lime, natural gas, sand and gravel, and stone. Output value decreases were noted for anthracite, copper, iron ore pellets, peat, crude petroleum, and zinc. The value of all natural gas liquids was 34% greater than 1971.

Compared with 1971 figures, the average f.o.b. mine value of anthracite increased 14 cents per ton and that of bituminous coal advanced 63 cents per ton. Collectively, solid-fuels production accounted for 63.3% of the total value of mineral production, and the value of all fossil fuels equaled 66.5% of total mineral production value. The production of anthracite was 18.6% less and its value was 17.6% less than in 1971. Bituminous coal production was 4.3% greater and its value was 11.9% greater than in 1971.

Leading mineral producing counties, with primary commodities in parentheses, were Washington, Greene, Indiana, Armstrong and Cambria (bituminous coal), Northampton and Lawrence (cement), and Schuylkill (anthracite). Cameron, and Pike Counties reported no mineral production. Pennsylvania led the Nation in stone production and was second in cement, third in lime and coal, and fourth in tripoli.

[1] Physical scientist, Division of Fossil Fuels—Mineral Supply.

Table 1.—Mineral production in Pennsylvania [1]

Mineral	1971 Quantity	1971 Value (thousands)	1972 Quantity	1972 Value (thousands)
Cement:				
Portland ---thousand short tons	7,850	$140,460	8,214	$156,008
Masonry ---do	419	11,247	451	12,401
Clays ---do	[2] 2,325	[2] 8,940	2,682	15,829
Coal:				
Anthracite ---do	8,727	103,469	7,106	85,251
Bituminous ---do	72,835	620,196	75,939	694,267
Copper (recoverable content of ores, etc.)—short tons	3,349	3,483	2,611	2,673
Gem stones	NA	9	NA	9
Lime ---thousand short tons	1,760	30,008	1,891	33,802
Natural gas ---million cubic feet	76,451	20,770	73,958	22,389
Peat ---thousand short tons	38	461	22	320
Petroleum (crude) ---thousand 42-gallon barrels	3,798	17,699	3,441	16,414
Sand and gravel ---thousand short tons	19,668	36,162	18,757	36,804
Stone ---do	64,467	118,469	67,307	124,340
Zinc (recoverable content of ores, etc.)—short tons	27,438	8,835	18,344	6,512
Value of items that cannot be disclosed: Clays (kaolin) (1971), cobalt (1971), gold (1971), iron ore, scrap mica, pyrites (1971), silver (1971), tripoli, and natural gas liquids	XX	28,899	XX	24,466
Total	XX	1,149,107	XX	1,231,485
Total 1967 constant dollars	XX	977,086	XX	[p] 1,024,472

[p] Preliminary. NA Not available. XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes kaolin; included with "Value of items that cannot be disclosed."

Table 2.—Value of mineral production in Pennsylvania, by county [1]

(Thousands)

County	1971	1972	Minerals produced in 1972 in order of value
Adams	W	W	Stone, lime, clays.
Allegheny	$47,246	$60,548	Coal, cement, clays, sand and gravel, natural gas.
Armstrong	54,037	58,365	Coal, clays, sand and gravel, stone.
Beaver	W	3,689	Coal, sand and gravel, clays, lime.
Bedford	W	W	Stone, sand and gravel, coal.
Berks	32,734	35,241	Iron ore, cement, stone, clays, coal, sand and gravel.
Blair	W	W	Stone, sand and gravel.
Bradford	W	W	Sand and gravel.
Bucks	W	13,628	Stone, sand and gravel, clays.
Butler	21,022	25,870	Coal, cement, lime, stone, sand and gravel, clays.
Cambria	W	W	Coal, stone.
Carbon	4,304	W	Coal, sand and gravel, stone.
Centre	22,025	20,859	Lime, coal, stone, clays.
Chester	W	W	Stone, lime, clays.
Clarion	30,485	W	Coal, stone, sand and gravel, clays.
Clearfield	47,923	47,716	Coal, clays.
Clinton	W	W	Coal, stone, clays.
Columbia	3,776	W	Coal, sand and gravel, stone, peat.
Crawford	585	555	Sand and gravel.
Cumberland	W	W	Stone, sand and gravel, clays.
Dauphin	2,145	W	Stone, coal, sand and gravel.
Delaware	W	W	Stone.
Elk	W	W	Coal, natural gas liquids, stone.
Erie	W	W	Sand and gravel, peat.
Fayette	16,146	18,468	Coal, stone, clays.
Forest	312	W	Sand and gravel.
Franklin	W	W	Stone, sand and gravel.
Fulton	W	535	Stone, sand and gravel, coal.
Greene	80,060	100,067	Coal.
Huntingdon	W	W	Sand and gravel, coal.
Indiana	73,014	72,629	Coal.
Jefferson	W	W	Coal, clays, stone.
Juniata	--	366	Stone.
Lackawanna	W	4,848	Coal, peat.
Lancaster	9,868	W	Stone, coal, sand and gravel, clays.
Lawrence	32,345	33,367	Cement, stone, coal, sand and gravel, clays, peat.
Lebanon	W	17,040	Iron ore, lime, copper, stone.
Lehigh	29,111	28,226	Cement, zinc, stone.
Luzerne	37,585	31,059	Coal, sand and gravel, stone, peat, clays.
Lycoming	W	4,182	Sand and gravel, stone, coal, tripoli.
McKean	W	W	Clays, stone.
Mercer	W	3,512	Coal, sand and gravel, stone.
Mifflin	W	W	Sand and gravel, stone.
Monroe	W	W	Stone, sand and gravel, clays, peat.
Montgomery	W	W	Stone, cement, lime, clays.
Montour	W	W	Stone, lime.
Northampton	77,694	84,217	Cement, stone, sand and gravel.
Northumberland	11,372	W	Coal, stone, sand and gravel, clays.
Perry	W	W	Stone.
Philadelphia	W	--	
Potter	101	29	Stone.
Schuylkill	W	W	Coal, stone, sand and gravel, clays.
Snyder	W	W	Stone, coal.
Somerset	30,957	28,503	Coal, stone, clays, sand and gravel.
Sullivan	1,116	581	Coal.
Susquehanna	553	661	Stone.
Tioga	4,376	W	Coal, sand and gravel.
Union	W	W	Stone, clays.
Venango	W	W	Coal, sand and gravel, natural gas liquids.
Warren	1,115	1,261	Sand and gravel.
Washington	W	W	Coal, stone, clays.
Wayne	W	W	Stone.
Westmoreland	28,249	29,369	Coal, sand and gravel, stone.
Wyoming	W	W	Sand and gravel.
York	26,408	28,994	Cement, stone, lime, clays, sand and gravel, mica.
Undistributed [2]	422,445	477,102	
Total [3]	1,149,107	1,231,485	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Cameron and Pike Counties are not listed because no production was reported.

[2] Includes values of natural gas, natural gas liquids (1971), petroleum, gem stones and some sand and gravel and stone that cannot be assigned to specific counties, and values indicated by the symbol W.

[3] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Pennsylvania business activity

	1971	1972 p	Change, percent
Employment and labor force, annual average:			
Total labor force ---thousands--	5,037.8	5,117.1	+1.6
Unemployment ---do----	261.5	271.3	+3.7
Employment (nonagricultural):			
Manufacturing ---do----	1,432.9	1,433.8	+.1
Construction ---do----	192.4	204.4	+6.2
Mining ---do----	38.1	40.2	+5.5
Transportation and public utilities ---do----	264.0	263.5	−.2
Wholesale and retail trade ---do----	840.3	862.3	+2.6
Finance, insurance, and real estate ---do----	194.4	201.4	+3.6
Services ---do----	696.0	715.4	+2.8
Government ---do----	629.2	650.2	+3.3
Personal income:			
Total ---millions--	$49,349	$53,029	+7.5
Per capita	$4,147	$4,457	+7.5
Construction activity:			
Value of authorized nonresidential construction--millions--	$384.0	$406.3	+5.8
Number of new residential units authorized	54,534	58,272	+6.9
Cement shipments to and within Pennsylvania thousand short tons--	3,538	3,428	−3.1
Mineral production value ---millions--	$1,149.1	$1,231.5	+7.2

p Preliminary.

Sources: Survey of Current Business; Employment and Earnings; Construction Review; Area Trends in Employment and Unemployment; and U.S. Bureau of Mines.

Table 4.—Worktime and injury experience in the mineral industries

Year and industry	Average men working daily	Days active	Man-days worked (thousands)	Man-hours worked (thousands)	Number of injuries		Injury rates per million man-hours	
					Fatal	Non-Fatal	Frequency	Severity
1971:								
Bituminous coal	22,438	235	5,280	42,498	32	1,100	26.64	NA
Anthracite	5,028	250	1,259	9,315	5	553	59.90	NA
Metal	1,195	315	377	3,014	2	33	11.61	4,896
Nonmetal	1,170	253	297	2,401	--	91	37.90	848
Sand and gravel	1,075	235	252	2,243	--	83	37.00	934
Stone	7,494	277	2,073	17,132	2	280	16.46	1,449
Total [1]	38,400	248	9,539	76,604	41	2,140	28.47	NA
1972:[2]								
Bituminous coal	NA	NA	NA	NA	NA	NA	NA	NA
Anthracite	NA	NA	NA	NA	NA	NA	NA	NA
Metal	1,210	263	319	2,551	4	48	20.39	12,490
Nonmetal	915	261	239	1,961	2	67	35.19	8,628
Sand and gravel	930	227	212	1,853	1	82	44.78	4,135
Stone	6,165	279	1,720	14,394	2	250	17.51	1,462
Total	NA	NA	NA	NA	NA	NA	NA	NA

NA Not available.

[1] Data may not add to totals shown because of independent rounding.

[2] In 1971 and earlier years, estimates were made of injury and employment data for those active operators who did not file reports; however, no estimates were made for active operators who did not report in 1972. Tabulations were made from data in file as of July 1, 1973, and are preliminary.

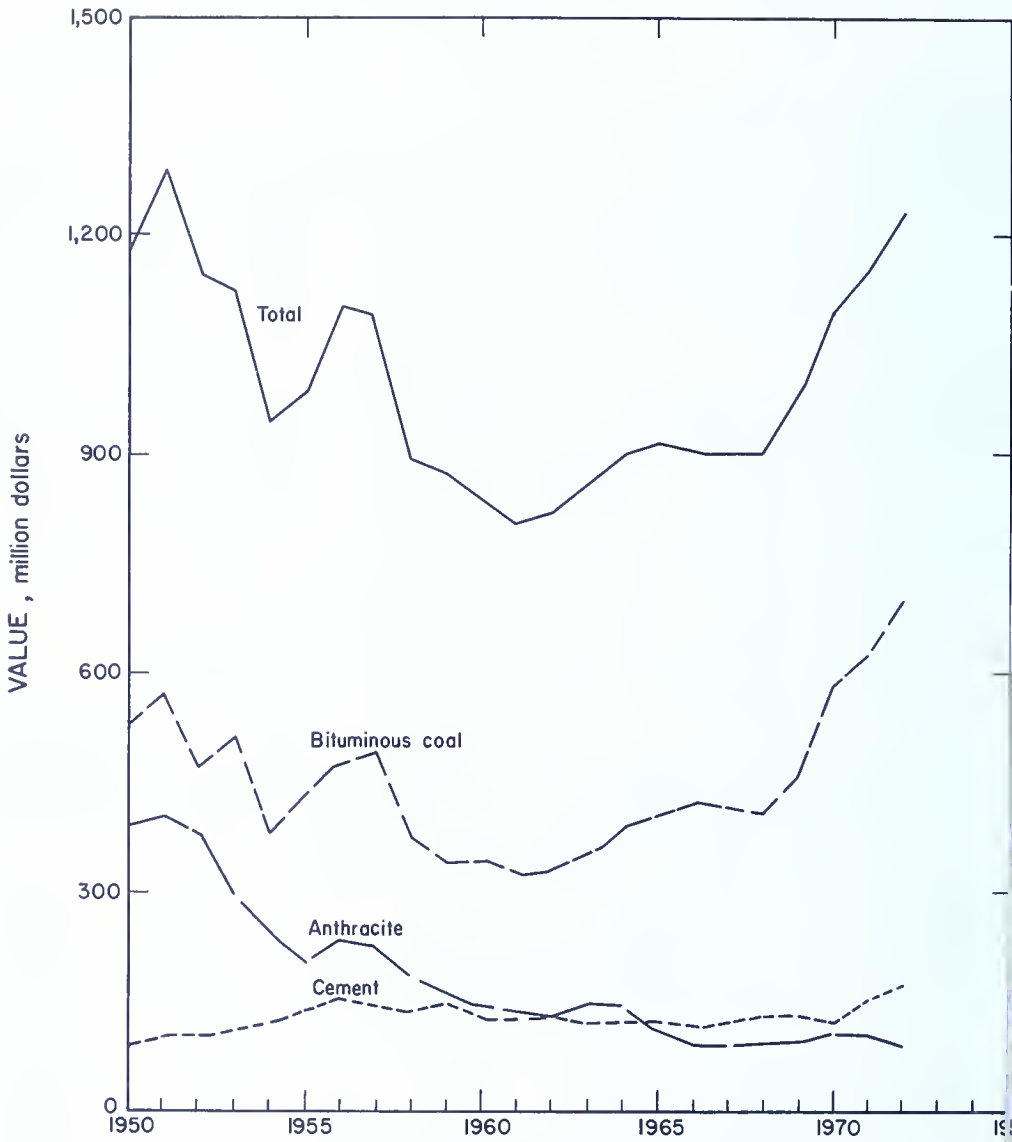


Figure 1.—Value of bituminous coal, anthracite, cement, and total value of mineral production in Pennsylvania.

Legislation and Government Programs.—Conservation legislation passed by the General Assembly and signed into law during 1972 comprised:

Act 20, providing for Interstate Air Pollution Agreements.

Act 153, an amendment to the Industrial Development Authority Law providing for loans to businesses conducting research and development on pollution control technology.

Act 154, providing for the inspection of emission control systems and making the removal of control devices unlawful.

Act 193, an amendment to the Land a Water Conservation and Reclamation decreasing the amount of money availa for the prevention, control, and elimi tion of air pollution from abandoned bu ing coal refuse banks; increasing the amo of money available for the prevention surface subsidence above abandoned m operations; and for the control and ex guishment of surface and underground fe in abandoned mines.

Act 278, providing for a mine subside fund within the Department of Envi mental Resources (DER) for insurance

compensation for damages to subscribers and for the payment and administration of funds by DER.

Act 355, an amendment to the Surface Mining and Reclamation Act further defining certain terms and further providing for license fees and exceptions.

Two contracts, totaling $1.7 million, were awarded in July by the Secretary of the Interior for a large-scale evaluation of advanced technology to prevent surface subsidence over flooded, abandoned underground mine workings. Under Bureau of Mines supervision, the project will experimentally backfill a 20-acre undermined area in the Green Ridge section of Scranton, using about 300,000 cubic yards of refuse from a massive local culm bank. The Empire Contracting Co., Old Forge, Pa., received one contract for crushing and hauling the refuse. A second contract for $900,000 went to The Dow Chemical Co.'s Dowell Division of Tulsa, Okla., to perform and monitor the 30-week backfill operation. One borehole was used to inject 177,000 cubic yards of fill material into the Clark bed. Four boreholes were used to inject 23,000 cubic yards of fill material into the New County bed. Formal dedication ceremonies were held October 20 when a complex pumping system was put into operation.

A letter of consent was granted November 14 by the U.S. Department of Housing and Urban Development (HUD) for expenditures up to $703,661 for the Minooka mine subsidence project. The letter enabled the Scranton Redevelopment Authority to use $883,832 of State funds without later using the Federal grants expected after the project was finally approved and a loan-and-grant contract was signed.

The Bureau of Mines in a $291,450 demonstration project reclaimed strip-mined land surrounding the site for a $1.5 million anthracite museum to be built by the State in the Keyser Valley area adjacent to the Pennsylvania Turnpike. About 70 acres were cleared and contoured, new roads were built, new topsoil was spread, and the area was landscaped.

In late October, the Bureau completed two major mine fire control projects in Lackawanna County. The National Bank project was started in May 1971 and cost $1,061,000. The Carbondale project, started in July 1969 and costing $2,326,000, was one of the largest mine fire control projects undertaken by the Appalachian Regional Commission (ARC).

The Bureau awarded a $606,000 contract to Mine Safety Appliances Co. (MSA), Pittsburgh, for the design, manufacture, and installation of a comprehensive mine air surveillance and monitoring system in the Bureau's demonstration mine at Bruceton. The mine does not produce coal, being used solely for controlled experiments.

The Bureau received bids October 10 to build a pilot plant at Bruceton to demonstrate the Synthane coal-gasification process. It was estimated that the pilot plant would cost $10 million and would be completed in 19 months.

A coal mine safety training facility at Seward was dedicated on February 4. The facility was financed by a $223,105 Bureau grant under a cooperative agreement with the Central Pennsylvania Coal Producers Association. Six classes, of 32 miners each, ground mine fire in Warrior Run Borough, received 8 weeks of training. Penn State's College of Earth and Mineral Sciences supplied the faculty and classroom instruction materials.

Pursuant to the Appalachian Regional Development Act of 1965, as amended, active mining area restoration projects during 1972 comprised 9 mine-fire control projects; one costing $77,210 was started in Indiana County, one costing $1,858,391 was in progress in Columbia County, four costing $3,769,351 were in progress in Luzerne County, one costing $34,104 was completed in Allegheny County, one costing $2,633,415 was completed in Lackawanna County, and one costing $16,692 was completed in Washington County. No work was started, in progress, or completed on projects relating to subsidence control, surface mine reclamation, well sealing, or mine pollution control. All of the active projects had 75% Federal funding and 25% State funding.

Appalachia projects approved for Pennsylvania during 1972 in fields related to mining are listed in table 5.

The Stearns Service Co., Inc., in September 1971 started work to halt an under-Luzerne County, under a $773,080 ARC contract. Mine fire experts warned that if the fire was not controlled it might result in an $80 million loss and damage 8,800 homes in Ashley, Hanover Township, Nanticoke, Sugar Notch, and Warrior Run.

Work continued on the Kehley Run mine

Table 5.—Appalachia projects approved for Pennsylvania during 1972 in fields relating to mining

Project	County	Total cost	ARC funds	State funds	Local funds	Date approve
South Side Scranton mine subsidence.	Lackawanna --	$4,793,074	$3,594,803	$1,198,271	--	May 1
Hills Section mine subsidence, City of Scranton.	----do --------	8,228,220	6,171,165	2,057,055	--	Oct. 1
Dickson City Boulevard section, mine refuse bank reclamation.	----do --------	258,500	193,875	64,625	--	Oct. 1
Conemaugh generating station access road.	Indiana -------	772,000	300,000	--	$472,000	July 1
Parsons Area subsidence, City of Wilkes-Barre (emergency).	Luzerne ------	2,220,000	1,665,000	555,000	--	Oct. 2
Homer City electric generating station [1].	Indiana ------	880,000	561,000	--	319,000	(1)

[1] This project was submitted in July 1972 but at yearend had not yet received approval the ARC.

fire near Shenandoah, Schuylkill County. The $10 million ARC project had been in progress 2 years.

In November, the Department of the Interior approved an ARC project to combat a fire in an abandoned Washington County coal mine by injecting dry fly ash into the mine to curtail the fire's air supply. The land surface above the fire will be plowed, sealed, and revegetated.

The Commonwealth's Department Commerce continued its activities for e couraging the influx of new and the e pansion of existing mineral-based-industri operations. Projects in 36 counties that we approved under mortgage provisions of t Industrial and Commercial Developme Authority Law of August 23, 1967, are list in table 6.

Table 6.—Mineral-industry-related projects approved under mortgage provisions of t Industrial and Commercial Development Authority Law

(January 1 to December 31, 1972)

Project category	Number of projects	Number of loans	Mortgage amount (thousands)	Project cost (thousands)
Pollution control ----------	23	27	$25,914	$26,285
Ferrous metals ----------	18	41	22,716	23,305
Nonferrous metals ----------	9	9	5,440	5,940
Electrical ----------	6	8	4,018	4,139
Miscellaneous ----------	4	6	1,454	1,454
Total ----------	60	91	59,542	61,123

Table 7.—Mineral-industry-related pollution-control projects approved under revenue bo provisions of the Industrial and Commercial Development Authority Law

(January 1 to December 31, 1972)

County	Mortgage amount (thousands)	Project cost (thousands)
Allegheny ----------	$40,000	$40,120
Beaver ----------	22,500	22,500
Do ----------	3,000	3,000
Butler ----------	3,250	3,250
Centre ----------	3,000	3,245
Delaware ----------	120,000	120,000
Do ----------	3,553	3,553
Lehigh ----------	20,000	20,000
Northhampton ----------	30,000	30,000
Total ----------	245,303	245,668

DER and the Ely Con Development orp. in February agreed on the final phase a contract to extinguish a mine fire at t. Carmel, Northumberland County. The al cost reportedly will be $9.2 million, least $832,000 under the original con- act cost. DER will pay Ely Con $1.28 per bic yard of solids excavated, and Ely on will pay DER $4.75 per ton of anthra- te extracted. DER by March 1972 had ready paid out $4.8 million of the esti- ated total cost. At yearend 1971 the pro- ct was 60% completed. Part of the 200- ot-deep, 32-acre site had been burning for out 20 years.

An underground mine fire was extin- ished in late November in the 4-foot vein the former Grassy Island Colliery work- ings of the Hudson Coal Co., Olyphant, Lackawanna County. The mine fire, adja- cent to a 2.5-million-ton culm bank, was extinguished after 150 hours of work cost- ing about $9,000.

An acidic mine water treatment plant costing $1,589,000 on a 30-acre site along Rausch Creek near Valley View, Schuylkill County, attained full operation during May. The plant was designed to neutralize 32 million gallons per day of water from 18 abandoned mines, 25 active mines, and two preparation plants.

Cost data for Operation Scarlift con- tracts awarded or approved during 1972 are shown in table 8. Projects completed in the 4 years ending December 31, 1972, and their costs are shown in table 9.

Table 8.—Operation Scarlift cost data, 1972

Project category	Statewide		Anthracite				Bituminous			
	Contract and agreements awarded or approved in 1972		Contract and agreements awarded or approved in 1972		Construction projects completed in 1972		Contract and agreements awarded or approved in 1972		Construction projects completed in 1972	
	Number	Cost	Number	Cost	Number	Cost	Number	Cost	Number	Cost
ream pollution abatement.	5	$210,365	2	$626,449	1	$102,167	12	$2,053,057	6	$1,130,041
r pollution	--	--	2	2,170,930	2	2,651,912	--	--	1	26,401
derground mine fires	--	--	--	--	--	--	1	46,900	5	195,114
bsidence	--	--	--	--	2	222,582	2	66,710	11	331,218
Total	5	210,365	4	2,797,379	5	2,976,661	15	2,166,667	23	1,682,774

Table 9.—Operation Scarlift: Summary of projects completed in the 4 years ending December 31, 1972

Project category	Anthracite		Bituminous		Total	
	Number	Cost	Number	Cost	Number	Cost
ream pollution abatement	21	$6,276,214	81	$8,766,763	102	$15,042,977
r pollution	8	11,658,641	7	177,887	15	11,836,528
derground mine fires	4	79,888	21	911,657	25	991,545
bsidence	10	1,066,255	27	1,479,519	37	2,545,774
Total	43	19,080,998	136	11,335,826	179	30,416,824

The U.S. Geological Survey in March rted a study, to be completed by yearend 72, of underground mine water pools in Wyoming Valley. DER in April awarded 34,899 contract to install pumps at bore- le sites. The study will permit DER to velop an overall plan to correct the dic water discharged from the pools and obtain gravity flow from the pools to luce pumping costs.

DER received sealed bids April 20 for removel of the Rotary mine refuse bank in the Parsons section of Wilkes-Barre. By October, the project had been one-half completed by Glasgow, Inc., of Glenside. About 1.25 million cubic yards of solids were to be loaded, transported, and spread on a low-lying area along the East End Boulevard in Plains Township. The re- moval of the refuse bank will provide a site for an industrial development project and will reduce the amount of acidic water and sediment entering Laurel Run Creek.

DER conducted mine subsidence evalua-

tions to prevent subsidence damage at 28 future new school sites. The DER's Bureau of Land Protection inspected 246 underground mines and conducted 11 technical study projects to confirm and refine DER's subsidence control requirements.

The Susquehanna River on June 26 flooded the downtown first-floor headquarters of the Pennsylvania Geologic Survey in Harrisburg, and caused a $1 million loss of books, records, maps, and equipment. Libraries donated back collections of periodicals, and new maps were obtained from the U.S. Geological Survey. However, the Survey still needed journals and geological books. After moving into other quarters, the Survey estimated that to regain its full functions will require 2 years.

The Luzerne County Commissioners, on November 15, authorized DER to level a refuse bank in Wilkes-Barre Township. The project will reclaim 113 acres for an industrial site and will correct a water pollution problem.

According to DER's Bureau of Surface Mine Reclamation, the 740 total mining licenses issued or renewed during calendar year 1972 numbered approximately 385 to 390 for bituminous coal, 50 for anthracite, and 300 to 305 for all other minerals. For bituminous coal only, mine drainage permits totaled 352, strip mining permits totaled 805, performance bonds issued for 13,700 acres totaled $8,051,000, and bonds released totaled $3,930,000.

Waters from tropical storm Agnes washed out 142 highway bridges including 11 listed as major and critical. Most of the bridges spanned the Susquehanna River between Sayre and Harrisburg. The Pennsylvania Department of Transportation (Penn DOT) estimated the total damage to bridges alone at $500 million.

For the fiscal year July 1, 1971, through June 30, 1972, Penn DOT spent $372,837,928 for the construction of highways. Of this amount, $344,437,996 was spent on construction contracts and $28,363,932 was spent on highway construction by Penn DOT forces.

According to the U.S. Federal Highway Administration the status of the Interstate System in Pennsylvania as of September 30 1972 was:

	Miles
Total mileage when completed	1,574
Free roads open to traffic	1,044
Total road (Pennsylvania turnpike) open	360
Total open to traffic	1,404
Roads under construction	71
Roads under design	99

Total cost of the 1,574-mile Interstate System is now estimated at 3,596 million with completion forecast for 1978. Cost to date has been $2,361 million.

Publications released in 1971 and 1972 that related to the mineral industry of Pennsylvania included three by the Bureau of Mines,[2] 10 by the U. S. Geological Survey[3], seven by the Pennsylvania Geologi

[2] Adams, L. M., J. P. Capp, and D. W. Gillmore. Coal Mine Soil and Refuse Bank Reclamation With Powerplant Fly Ash. Compos Science. J. Waste Recycling, v. 13, No. 6, 1972 pp. 20–26.

The Mitre Corp. Environmental Action Programs for Northeastern Pennsylvania Refuse Bank Removal/Subsidence Monitoring. BuMine Available from National Technical Information Open File Rept. 3–73, November 1972, 529 pp Service, Springfield, Va., PB 214–545, $9.00.

Rennick, J. E., J. Pasini III, F. E. Armstrong, and J. R. Abrams. Demonstration o Safety Plugging of Oil Wells Penetrating Ap palachian Coal Mines. BuMines TPR 56, 1972 23 pp.

[3] Averitt, P., and C. Lopez. Bibliography an Index of the U. S. Geological Survey Publications Relating to Coal, 1882–1970. U.S. Geol Survey Bull. 1377, 1972, 173 pp.

Freedman, J. Geochemical Prospecting fo Zinc, Lead, Copper, and Silver, Lancaster Valley, Southeastern Pennsylvania. U.S. Geol. Survey Bull. 1314–C, 1972, pp. C1–49.

Hosterman, J. W. Underclay Deposits o Somerset and Eastern Fayette Counties, Penn sylvania. U.S. Geol. Survey Bull. 1363, 1972, 1 pp.

Hosterman, J. W. White Clay Deposits o Centre, Blair, Huntingdon, and Bedford Coun ties, Pennsylvania. U.S. Geol. Survey Prof Paper 800–B, 1972, pp. B57–B65.

Kent, B. H. Geologic Map of the Prosperity Quadrangle, Southwestern Pennsylvania. U. S Geol. Survey GQ–1003, 1972, one sheet.

Patterson, E. D., and J. A. Van Lieu. Geologi and Coal Bed Maps of Clarion County, Pa. U S Geol. Survey Misc. Geol. Inv. Map I–715, 197 one sheet.

Rima, D. R., E. B. Chase, and B. M. Myers Subsurface Waste Disposal by Means of Wells U.S. Geol. Survey Water Supply Paper 202 1971, 305 p.

Williams, K. F., and L. A. Reed. Appraisa of Stream Sedimentation in the Susquehanna River Basin. U.S. Geol. Survey Water Suppl Paper 1532–F, 1972. pp. F1–F24.

Wood, G H., Jr. Geologic Map of Anthracite Bearing Rocks in the North Part of the Orwigsburg Quadrangle, Schuylkill County, Pa. U.S Geol. Survey Misc. Geol. Inv. Map I–689, 1972 one sheet.

Wood, G. H., Jr. Geologic Map of Anthracite Bearing Rocks in the Pottsville Quadrangle Schuylkill County, Pa. U.S. Geol. Survey Misc Geol. Inv. Map I–681, 1972, two sheets.

urvey[4], and five miscellaneous papers.[5]

Environment.—Environmental problems nd their modification, conflicts of laws, nd jurisdictional disputes were prominent n Pennsylvania's mineral-industry-related ews. Many of the abatement projects were unded by a portion of the $500 million ond issue for conservation authorized in he May 1966 primary election. Pollution ontrol projects approved under revenue ond provisions of the Industrial and Com- ercial Development Authority Law are sted in table 7.

The State received the brunt of tropical orm Agnes, whose rainfall in the June 20) 25 period ranged from 4 inches near ie Ohio border to 14 to 18 inches on por- ons of Dauphin, Lebanon, Northumber- nd, and Schuylkill Counties. Flood crests n the Susquehanna River were 15.5 to 18.5 et above flood stage. The total estimated amage in the State was about $2 billion, vice the total amount in all other States fected by Agnes. Harrisburg and Wilkes- arre sustained inordinate hardships.

Air Pollution.—The DER established new atewide standards for sulfur dioxide emis- ons for the first time. These standards, satisfy compliance with Environmental rotection Agency (EPA) guidelines, re- aced the standards in the Air Pollution ontrol Act of 1960.[6] The Pennsylvania air ws were adopted September 2, 1971, nended January 27, 1972, and became ef- ctive March 20, 1972.

In late May, EPA approved only three tegories of DER plans, all of which were andatory under the Federal Clean Air ct. Approval was made on compliance hedules, the review of new sources of r pollution, and the control and regula- on of carbon monoxide. The 11 categories sapproved by EPA were legal authority, ailability of data made public, sulfur ides, particulate matter, photochemical idants, nitrogen oxides and hydrocarbons, ergency episodes, surveillance of air ality, resources, surveillance sources, and tergovernment cooperation.

EPA regulations required the DER's vironmental Quality Board to implement ans for NO_x control. However, the con- l strategy published in the Federal Reg- er related only to gas- and oil-fired boil- and contained no limitations for coal- ed equipment.

The DER did not collect information on pollution control installations made in 1972 in 65 counties, other than Allegheny and Philadelphia Counties, because such information was not required for Federal grant applications.

Expenditures for emission reduction equipment completed or to be installed in Philadelphia County in 1972–73 comprised $290,000 total for electrostatic precipitators to collect 53.0 total tons per year of particulates at three nonferrous industries, $340,000 total for one baghouse and one high-energy filtration system to collect 237.3 tons per year of particulates at two asphalt plants; and $400,000 for one baghouse to collect 365 tons per year of particulates at the coke-screening operation of the Philadelphia Coke Division, Eastern Gas and Fuel Associates. One Philadelphia County petroleum refinery continued work in the third year of a 5-year Comprehensive Refining Control Program that will cost $16.5 million for storage tank conversions, bulk

[4] Cramer, H. R. Annotated Bibliography of Pennsylvania Geology—Supplement to 1969, Pa. Geol. Survey, 1972, 345 pp.

Edmunds, W. E. Coal Reserves of Pennsylvania: Total Recoverable, and Strippable (January 1, 1970). Pa. Geol. Survey IC 72, 1972, 40 pp.

Hallowell, J. R. Hydrology of Pleistocene Sediments in the Wyoming Valley, Luzerne County, Pennsylvania. Pa. Geol. Survey Bull. W 28, 1971, 77 pp.

Hoover, K. V., T. E. Saylor, M. Lapham, and M. E. Tyrell. Properties and Uses of Pennsylvania Shales and Clays, Southeastern Pennsylvania. Pa. Geol. Survey Pub. M 63, 1972, 329 pp.

Lytle, W. S., and L. Heyman. Oil and Gas Developments in Pennsylvania in 1971. Pa. Geol. Survey Progress Report 184, 1972, 39 pp.

Pa. Geol. Survey. Pennsylvania Geological Publications. May 1972, 65 pp.

Poth, C. W. The Ground-Water Observation Well Program in Pennsylvania. Pa. Geol. Survey Pub. W 20. (2d ed.), 1972, 18 pp.

[5] Bureau of Mines—Atlantic Richfield Co. Pennsylvania and Its Natural Resources. 16mm. color, sound films; 27 minutes. Available for short-term loan from Motion Pictures, Bureau of Mines, U.S. Department of the Interior, 4800 Forbes Avenue, Pittsburgh, Pa. 15213.

Lapham, D. M., and K. V. Hoover. Preliminary Evaluation of the Factors Affecting the Use Potential of Clays and Shales in Pennsylvania. Trans. AIME, v. 250, 1971, pp. 292–296.

Lavin, P. M., R. H. Merkel, S. S. Alexander, and R. J. Greenfield. New Applications of Geophysical Methods to Ground-Water Problems in Pennsylvania. Earth and Mineral Sciences, (The Pennsylvania State University), v. 41, No. 5, February 1972, pp. 33–40.

McGaslin, J. C. Appalachian Basins Gas Reserves Lie in Wait. Oil and Gas J., v. 70, No. 25, June 19, 1972, p. 85.

Weaver, O. D., W. L. Calvert, and W. H. McGuire. Here are the Principal Exploratory Objectives of the Appalachian Basin. Oil and Gas J., v. 7, No. 4, Jan. 25, 1972, pp. 100–104.

[6] Department of Environmental Resources. Pennsylvania Air Pollution General Rules. Title 25, Rules and Regulations: Part 1, Subpart C, Article III, Air Resources. September 1971, 55 pp.

loading terminal controls, sulfur recovery facilities, process and equipment modifications, and combustion controls. When completed, the program was expected to eliminate the annual emissions of 7,320 tons of hydrocarbons, 9,835 tons of sulfur dioxide, and 9,540 tons of carbon monoxide.

Allegheny County was foremost in the State's pollution news and activities. The Allegheny County Health Department (ACHD) operated 49 air-monitoring stations that indicated an overall 8% decrease in particulate levels and a 33% decrease in sulfur dioxide levels compared with the 1971 overall levels.

ACHD's plans were directed to achieve EPA primary air quality standards by 1975. Interim measures planned for 1973 included a survey of area plants to identify emissions and to develop programs for compliance with ACHD's new air pollution standards, the annual review and issuance of permits for air pollution sources, and the relocation of the Courthouse monitoring station accompanied by the addition of devices for measuring nitrogen oxides, ozone, and hydrocarbons.

ACHD's new air pollution code, effective June 15, was more stringent than the 1970 code. Sulfur dioxide limits were lowered another 60% to 75%; 90% of the sulfur had to be removed from coke oven gas; the number of blast furnace slips was limited; and the limit on particulates emitted from powerplants, steel plants, and iron foundries was lowered. Smoke limits were reduced 50%, and Ringelmann No. 3 or darker was classed as a violation at any time.

The DER's Division of Mine Drainage and Erosion issued 23 water permits to operators of underground bituminous coal, limestone, and clay mines.

A 500,000-gallon-per-day (gpd) mine wastewater treatment plant was completed in Indiana County. The water treatment, based on the relatively new Desal process developed by the Rohm and Haas Co., used an ion-exchange resin capable of operation in the presence of bicarbonates. The aqueous effluent was aerated to precipitate iron and manganese. The total cost for treating a typical acidic mine water containing 1,000 parts per million (ppm) iron was estimated at about 30 cents per 1,000 gallons.[7]

The Burgettstown demineralization plant operated by the Smith Township Municipal Authority was described.[8]

A 3-day program relating to the contro of water pollution from coal mining wa held at Penn State October 4 through (Included were discussions on preventin and minimizing drainage formation, trea ment procedures, and governmental regul tions.

The Fourth Symposium on Coal Min Drainage Research was held April 27 at th Mellon Institute in Pittsburgh. More tha 400 attendees heard 32 technical papers o the remaining problems and emerging ar swers of mine drainage control. The bier nial symposium was organized by Bitumir ous Coal Research, Inc. (BCR), Monroevill with program planning help from EPA DER, and the Ohio River Valley Sanitatio Commission (ORANSCO).

Solid Wastes.—The EPA approved $103,000 grant in November for a 6-mont study of the feasibility of moving refus from Philadelphia by railroad to aban doned anthracite strip mine pits. If th idea appears practical, Philadelphia wil be eligible for a $551,000 EPA grant to com plete the plan, which hopefully would b operable in June 1974.

DER denied Lycoming County's applica tion to use a bituminous coal strip mine i Cogan House Township for landfill pu poses. The denial was based on the poss ble pollution of underground water an insufficient ground cover material at th site.

At yearend, the chairman of the State' House Conservation Committee recom mended a feasibility study on returnin coal wastes underground and on findin new uses for such wastes.

Two abandoned strip pits in Zerbe Towr ship were considered as sanitary landfi sites for 80,000 tons of solid wastes ger erated annually in Northumberland County

DER approved the cost of a reclamatio project at a culm bank near the Boulevar Redevelopment Area in Dickson City Lackawanna County.

The Montgomery County Redevelopmen Authority awarded a $46,000 contract t the University Science Center, Philadelphia to determine if some profitable, or at leas useful, use could be found for 1.5 millio cubic yards of waste carbonate, magnesia

[7] Engineering and Mining Journal. Searchin for Solution to Pollution Problems. V. 173, N 6, June 1972, pp. 178–183.

[8] Zabbin, W., T. Fithian, and D. R. Maneval Converting AMD to Potable Water by Ion Exchange Treatment. Coal Age, v. 77, No. 7 July 1972, pp. 107–111.

and asbestos that have accumulated since 1867 on a 25-acre site in downtown Ambler. The authority wanted the site for an urban renewal housing project.

Laboratory tests continued in 1972 on the use of sewage plant sludge and effluent water as fertilizing agents to induce the growth of vegetation on acidic spoil banks at solid fuel strip mines. These tests had been in progress since 1968 under the Penn State Waste Water Conservation and Renovation Research Program funded by a grant from the Office of Water Resources Research (OWRR) of the U.S. Department of the Interior. The project was to be demonstrated in 1973 on an extensive acreage of nonproductive spoil banks and some forest areas.

At U.S. Steel's Frick District Robena coal preparation plant, 500 tons of fly ash was spread to a 6-inch depth on a 4-acre experimental refuse area to determine the capability of fly ash as a soil conditioner.

U.S. Steel converted 60 acres of its main slag dump area, known as Brown's dump, as a site for a shopping center near Pittsburgh. The dump was separated from the shopping center by a high terrace.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal (Anthracite).—The 7,106,295-short-ton production, the smallest in 10 consecutive years, was 18.6% less than in 1971 and was 17.6% less in value. The average value of all production increased 14 cents to $12.00 per ton.

Compared with 1971, decreases in production were as follows: underground 26.7%, strip, 22.3% and culm bank, 14.4%. Production of dredged coal was 22.3% greater than in 1971. River dredged anthracite accounted for 6.1% of the State's total production and 3.5% of its total value.

Twelve companies, each of which produced more than 200,000 tons, produced 4,271,966 tons or about two-thirds of the State's production, excluding that from dredging.

According to DER data, production originated from 117 underground mines, from 115 strip mines operated under 149 stripping permits, from 63 culm banks operated by 37 companies, and from river dredging by eight companies. Production of 6,629,503 short tons, excluding 476,792 tons from dredging operations, was processed at 55 breakers, 13 cleaning plants, one sizing plant, and five washeries. Essentially, all of the washing and cleaning were performed using dense-medium vessels, cyclones, and Wemco-type cones.

Production by counties is shown in table 10.

Table 10.—Pennsylvania: Anthracite production and value by county

(Thousand short tons and thousand dollars)

County	Production [1]	Value [1]
Carbon	183	2,042
Columbia	98	1,475
Dauphin	47	435
Lackawanna	311	4,827
Luzerne	2,097	28,567
Northumberland	901	9,345
Schuylkill	2,924	34,980
Sullivan	68	582
Total [2]	6,629	82,253
Dredge production, total [3]	477	2,998
Grand total	7,106	85,251

[1] For shipments leaving possession of producing companies; does not include selling expense.
[2] Excludes dredged production.
[3] For Berks, Dauphin, Lancaster, Northumberland, and Snyder Counties.

The total production and its value are distributed as follows:

	Production (thousand short tons)	Value (thousand dollars)	Value (per ton
Shipped by railroad	2,601	31,338	$12.05
Shipped by truck	4,017	50,696	12.62
Colliery fuel	11	172	15.64
Dredge coal	477	3,044	6.38
Total	7,106 [1]	85,251	12.00

[1] Data do not add to total shown because of independent rounding.

Commercial exports, principally to Canada and Western Europe, totaled 743,451 short tons, 72,451 tons more than in 1971, and were valued at $10,921,970. Commercial

exports through Philadelphia totaled 551,987 tons and included a record cargo of 30,850 tons loaded November 29 and consigned to Dunkerque, France. The Federal Government purchased 447,728 short tons, compared with 718,000 short tons in 1971, to supply most of the solid-fuel needs of the U.S. Armed Forces in West Germany.

Domestic consumption in short tons comprised 2,960,000 for residential and commercial heating, 603,000 for miscellaneous industrial uses, 1,584,000 for electric utilities, 474,000 for coke plants, 283,000 for sintering and pelletizing, and 11,000 for colliery fuel.

Approximately 110 small underground mines that produced about 1 million tons in 1971 in the Western Middle, Southern, and Eastern Middle fields were flooded in late June 1972. Reportedly, the net result was an estimated annual loss of 1.17 million tons of production and the employment of 1,800 mining personnel and 1,800 affiliated service employees. Only a few underground mine operators were financially able to rehabilitate the flooded mines.

On the basis of salable production, the loading of coal in underground mines was done by 10 mobile loading machines for 135,728 tons, by 52 scraper loaders for 346,884 tons, by one duckbill for 1,929 tons, by 39 hand-loaded face conveyors for 109,456 tons, and by hand loading for 350,318 tons. The consumption of permissible explosives averaged 0.808 pound per ton of underground production.

Equipment used in strip mines included 60 front-end loaders, 19 electric shovels, 33 diesel shovels, 42 electric draglines, and 68 diesel draglines. Equipment used at culm banks included 43 front-end loaders, eight diesel shovels, one gasoline powered dragline, and seven diesel draglines.

The reclamation of strip-mined land comprised 147 acres provided with grass seed, lime, and fertilizer, and 142 acres planted with 185,000 seedling trees and 12,000 wildlife-cover shrubs furnished by the Pennsylvania Game Commission. This was the first use of such shrubs on reclaimed stripped land in the State.

One fatal accident occured in underground mines and two in strip mines. The entire anthracite industry had 272 nonfatal accidents.

Comparative productivity data for 1971 and 1972, shown in table 11, indicate that the average productivity based on tons of total salable production, excluding that from dredging, was 6.0% greater in 1972.

Table 11.—Pennsylvania: Anthracite productivity data, 1971–72

Activity	Production (short tons)		Man-days [1]		Productivity (tons per man-day)		Change, percent
	1971	1972	1971	1972	1971	1972	
Deep mined:							
Extraction	1,245,326	896,991	304,298	197,242	4.09	4.55	+11.2
Preparation [2]	1,245,326	896,991	55,437	41,654	22.46	21.53	−4.1
Total or average	1,245,326	896,991	359,735	238,896	3.46	3.75	+8.4
Strip mined:							
Extraction	4,450,457	3,492,444	531,960	393,825	8.37	8.87	+5.9
Preparation [2]	4,450,457	3,492,444	198,119	102,205	22.46	21.53	−4.1
Total or average	4,450,457	3,492,444	730,079	556,030	6.10	6.28	+2.9
Culm bank:							
Extraction	2,492,178	2,072,658	79,044	48,656	31.53	42.60	+35.1
Preparation [2]	2,093,906	2,072,658	93,214	96,242	22.46	21.53	−4.1
Total or average	2,492,178	2,072,658	172,258	144,898	14.47	14.30	−1.2
State total: [3]							
Extraction	8,187,961	6,462,903	915,302	639,723	8.95	10.10	+12.8
Preparation [2]	7,789,689	6,462,903	346,770	300,101	22.46	21.53	−4.1
Total or average [4]	8,187,961	[5] 6,462,903	1,262,072	939,824	6.49	6.88	+6.0

[1] Includes personnel engaged in maintenance, haulage, stripped-land surface reclamation, etc.
[2] Comprises breakers, cleaning plants, bagging plants, and sizing pockets.
[3] Excludes dredged product.
[4] Includes production without preparation comprising 398,272 tons from culm banks.
[5] Includes undisclosable production sold without preparation, from culm banks.

Note: All data in this table were derived from annual reports published by the Anthracite and Bituminous Division of the Pennsylvania Department of Environmental Resources that summarize mandatory monthly reports submitted by the anthracite industry.

A member of the Anthracite Conservation Association, during a March 28 meeting of the Economic Development Council of Northeastern Pennsylvania, cited the following reasons for the decline of deep-mined U.S. anthracite production: Lack of confidence that discouraged investments, lack of research to develop new markets, lack of employment appeal, costlier deep mining because of inflationary pressures, restrictive State and Federal legislation that discouraged development and increased costs to an already burdensome level, and public image of environmental damage.

A 3-year contract that raised the pay of anthracite miners to $29 per day was accepted by the United Mine Workers Union (UMWA) negotiators on April 16. The new contract included a $5-per-day wage increase retroactive to April 1, 1972 and an equal raise effective April 1, 1973 and April 1, 1974.

An Anthracite Industry Study Committee, comprising industry and UMWA members, was created by the 1972 contract. In late November, this committee met with Governor Shapp and urged his administration to seek ways to help stop the decline of the industry. In the 1-day session, Penn State faculty members presented the current state of technology and the possibilities of improvements in various phases of the anthracite problem. One suggestion for the short-term was to promote the use of anthracite in urban areas where low-sulfur fuel was a requirement established by the EPA. The long-term promotion involved the production of pipeline-quality gas and the generation of electricity in steam-electric plants using the French-developed pressurized fluid combustion process. Based on the current value of anthracite, the estimated value of the anthracite in Pennsylvania's reserves was reportedly $88 billion.

Tropical storm Agnes resulted in subsidences near homes in Mahonoy City, in the Craigs and Hill sections of Mahonoy Township, and in the Glenn Lynn and Parsons section near Wilkes-Barre. A mudslide closed the entry of the abandoned Lincoln Colliery near Mollystown and inundated an estimated 40 million gallons of water that flooded the active deep mine of the Zimmerman Coal Co. A mine flushing project was started during late July in the affected Parsons section of Wilkes-Barre. About 2 months were required to pump 10,000 cubic yards of screened culm bank solids into voids of the near-surface Kidney and Rock veins.

The DER on June 12 ordered immediate action to improve the stability of three silt basin impoundments. Orders were sent to the Harry E. Coal Co. breaker at Swoyersville; the New St. Nicholas breaker at Duncott, Schuylkill County; and the Leon E. Kocher Coal Co. breaker in Hegins Township, Schuylkill County. A new silt dam satisfying DER's requirements was under construction at the New St. Nicholas breaker at the eastern end of the existing giant silt basin. The Environmental Hearing Board asked the DER to make a further study of a silt basin owned by the Leon E. Kocher Coal Co. in Valley View before use of the basin could be halted. The Board noted a conflict between DER's rules that left the burden of proof to the company to show that the basin was safe and the Board's rules that placed the burden of proof on the DER to prove that the basin was unsafe.

The DER on July 26 ordered Manbeck Dredging, Inc., Schuylkill Haven, to stop the discharge of silt into a basin behind an unsafe dam. The DER filed suit July 31 in Schuylkill County Court against Phoenix Contracting Co. for allegedly dumping waste materials from its abandoned coal washery north of Sheridan in Porter Township into an adjacent waterway.

The State spent about $120,000 for electricity in 1972 to pump acidic mine water into the Susquehanna River in the Hudson section of Plains Township. The State acquired in April, 1 acre of land in Hollenback Park, Wilkes-Barre, for a pumping station to stabilize the water level in the abandoned Pine Ridge Colliery mine. The station will discharge water into the nearby Mill Creek.

Table 12 shows the number of underground and surface mines opened annually in the 1970–72 period, their estimated annual production, and the number of employees.

Table 13 shows the number of underground anthracite mines that were permanently abandoned since December 1969 in six counties, their estimated annual tonnage, and the number of employees affected. The number of reasons given for the mine abandonments in the 1970–72 period were as follows: 25, worked out; 15, economic conditions; 10, maintenance too costly; six, water conditions; five, lack of

Table 12.—Pennsylvania: Anthracite mines opened in the 1970–72 period

Type of mine	Number of mines	Estimated annual production (thousand tons)	Number of employees
Underground:			
1970	--	--	--
1971	3	14	15
1972	2	3	5
Total	5	17	20
Surface:			
1970	--	--	--
1971	19	1,137	161
1972	12	740	46
Total	31	1,877	207

Source: Bureau of Mines, Coal Mine Health and Safety, District 1.

Table 13.—Pennsylvania: Underground anthracite mines permanently abandoned sinc December 1969

County	Number of mines	Estimated annual production (short tons)	Number of Employee
Schuylkill:			
1970	11	64,750	41
1971	14	107,750	82
1972	12	61,250	55
Total	37	233,750	178
Luzerne:			
1970	2	138,750	157
1971	1	5,000	6
1972	1	45,000	4
Total	4	188,750	167
Northumberland:			
1970	9	74,500	59
1971	6	34,250	34
1972	7	22,500	22
Total	22	131,250	115
Carbon:			
1970	--	--	--
1971	1	3,750	2
1972	1	22,500	11
Total	2	26,250	13
Dauphin:			
1970	1	3,500	3
1971	--	--	--
1972	--	--	--
Total	1	3,500	3
Lackawanna:			
1970	--	--	--
1971	--	--	--
1972	1	2,500	4
Total	1	2,500	4
Totals:			
1970	23	281,500	260
1971	22	150,750	124
1972	22	153,750	96
1970–72	67	586,000	480

Source: Bureau of Mines, Coal Mine Health and Safety, District 1.

anpower; four, no market for low-quality roduct; and two, Federal closures.

Coal (Bituminous).—The 75.94-million-ons of production was valued at $694.27 illion, equal to an average f.o.b. mine alue of $9.14 per ton compared to $8.51 er ton in 1971. Open market sales totaled 3.69 million tons and averaged $8.06 per on at the mine, and 19.25 million tons of iptive coal averaged $12.32 at the mine. Approximately 50.4 million tons was ansported by rail or water, including 18.2 illion tons by unit train, 8.1 million tons y conveyor belt, and 17.0 million tons by uck. The remainder of the total produc-on, or about 440,000 tons, was used for cal domestic heating, for heat and power eneration at mines, and in beehive coke roduction.

Washington, Greene, Indiana, Cambria, nd Armstrong Counties produced 39.04 illion tons, or 79.5%, of the total deep-ined coal. Clearfield, Clarion, Armstrong, merset, and Indiana Counties produced 5.42 million tons, or 58.7%, of the total rip-mined coal. Armstrong, Somerset, In-ana, Jefferson, and Clearfield Counties roduced 364,000 tons, or 67.2%, of the tal auger-mined coal. Collectively, Wash-gton, Greene, Indiana, Armstrong, and ambria Counties produced 46.40 million ns, or 61.1%, of the State's total bitumin-is coal production.

Active mines producing more than 1,000 ns per year totaled 836; 159 were deep ines, 22 fewer than in 1971; 622 were strip ines, 95 more than in 1971; and 55 were ger mines, two fewer than in 1970.

The 49.13-million-ton underground pro-uction had an average f.o.b. mine value $10.39 per ton, compared with an aver-e f.o.b. mine value of $9.88 per ton for e 44.29-million-ton underground produc-on in 1971.

Seventy-one mechanical cleaning plants, ree more than in 1971, produced 45.6 mil-on ton of salable coal and 16.0 million ns of refuse. The percentages of cleaned al by origin were deep mines, 86.19; strip ines, 13.74; and auger mines, 0.07. Wet ashing equipment by types and their pro-uction of cleaned coal in million tons re as follows: table, 4.2; launders, 1.4; oth-flotation, 1.9; dense medium, 17.6; assifiers, 0.4; and jigs, 12.7. Pneumatic-pe equipment produced 7.4 million tons cleaned coal.

Thirteen plants operated 21 thermal drying units to produce 5.57 million tons. One hundred forty-nine plants crushed 57.5 million tons of coal.

Shipments of new equipment to the State's underground coal mines in 1972 included two mobile loaders, 53 continuous miners, four longwall units, 10 shuttle cars, 54 rubber-tired tractors, 39 battery-powered front-end loaders, 189 rubber-tired mine cars, and 76 gathering and haulage conveyors.

The Alpine Equipment Corp., State College, Pa., sold 18 mining machines in the United States in 1972. Thirteen machines went to underground coal mines including two shipped to Pennsylvania mines.

Continuous mining machines totaled 498, three fewer than in 1971, and produced 43.0 million tons of coal, 5.43 million tons more than in 1971. These machines comprised ripper, boring, rotary drum, and oscillating-disk-head types. Because 41 machines were not designed to perform loading, 41 mobile loaders were teamed with them to load 4.06 million tons from the mine floor. Fifty-five continuous-mining machines mined and loaded 3.13 million tons onto feeder-conveyors, and 402 machines mined and loaded 35.79 million tons into shuttle cars and rubber-tired mine cars.

Twelve longwall sytems produced 2,353,-615 tons of coal, 428,615 tons more than the 1,925,000 tons produced by nine longwall systems in 1971. In 1972 one planer-type installation produced 264,887 tons, and 11 shearer-type installations produced 2,088,728 tons.

Twelve mobile loaders discharged 407,564 tons into mine cars or onto conveyors, and 3,239,650 tons was loaded into shuttle cars and rubber-tired mine cars by 56 mobile loaders. A total of 135,434 tons was loaded by duckbills, scraper loaders, and hand-loaded face conveyors, and by hand.

A total of 70 cutting machines, 65 fewer than in 1971, were used to cut 2,641,462 tons. Coal shot from the solid totaled 3,609 tons.

Coal drilling by 54 hand-held or post-mounted drills, 26 fewer than in 1971, was used to produced 2,221,405 tons, and 21 mobile drills, 17 fewer than in 1971, were used to produce 2,393,861 tons.

Roof bolting employed 318 rotary drills, 42 more than in 1971, and 231 percussion drills, 34 fewer than in 1971. Roof or rock

drills used for other purposes included 15 rotary drills, 23 fewer than in 1971, and 20 percussion drills, 12 less than in 1971.

Seventy-six mines installed 8,006,369 roof bolts, all new, either as the sole method of roof support or in conjunction with other roof support materials. These 76 mines produced 45,060,662 tons of coal including 40,834,602 tons produced under roof supported only by bolts.

Equipment used to haul run-of-mine coal, rock, operating supplies, and personnel in deep mines included 1,102 trolley locomotives, 80 more than in 1971; 38 battery-powered locomotives, 30 fewer than in 1971; 12,376 rail mine cars, 200 fewer than in 1971; 498 miles of mainline track and 295 miles of other track; and 634 gathering and haulage conveyor belts, 15 more than in 1971, averaging 2,010 feet in length and totaling 260.3 miles compared with 225.1 miles in 1971. Considerable intermediate haulage was done by 1,072 cable reel shuttle cars and 19 battery-powered shuttle cars, eight shuttle buggies, 287 rubber-tired tractors, and 587 rubber-tired trailers.

Strip-mining equipment included 436 power shovels, 31 fewer than in 1971, and 301 draglines, 24 fewer than in 1971. Approximately 96.7% of the total number of shovels and draglines were classed as diesel-electric and diesel, and 74% were rated at less than 5-cubic-yard capacity. Of the 46 carryall scrapers in operation, eight fewer than in 1971, 12 were rated at less than 15-cubic-yard capacity. Other strip-mining equipment included 862 bulldozers, 25 horizontal drills, 146 vertical drills, 465 front-end loaders, eight wheel excavators, one power broom, 38 motor graders, and nine coal drills. No data were available on the truck haulage of run-of-mine coal. The 26.26-million-ton strip-mined production averaged $6.86 per ton f.o.b. mine, compared with a $6.41 per ton f.o.b. mine value for the 28.0-million-ton production in 1971. The C & K Coal Co. was the largest producer of strip-mined coal, with 2.2 million tons from 11 operations, all in Clarion County.

Active equipment for auger mining included 40 augers, 28 bulldozers, two carryall scrapers, one diesel shovel rated at less than 5-cubic-yard capacity, and four front-end loaders. The 542,115-ton auger-mined production averaged $6.37 per ton at the mine, compared with a $6.04 per ton average f.o.b. mine value for the 544,211-ton production in 1971.

Table 14.—Pennsylvania: Bituminous coal production, by type of mine and county

(Excludes mines producing less than 1,000 short tons annually)

County	Number of mines				Production (thousand short tons)				Value (thousands) [2]
	Underground	Strip	Auger	Total	Underground	Strip	Auger	Total [1]	
Allegheny	7	10	--	17	3,780	771	--	4,551	$44,890
Armstrong	19	59	11	89	5,241	2,539	96	7,876	55,992
Beaver	1	3	4	8	130	122	32	284	2,117
Bedford	1	--	--	1	1	--	--	1	W
Butler	4	31	2	37	565	977	54	1,596	9,715
Cambria	20	21	--	41	6,401	968	--	7,368	95,201
Centre	1	13	--	14	448	618	--	1,067	8,132
Clarion	--	62	--	62	--	4,281	--	4,281	31,120
Clearfield	10	97	6	113	1,094	4,568	55	5,718	40,873
Clinton	--	11	--	11	--	240	--	240	1,609
Elk	--	14	4	18	--	336	31	367	2,424
Fayette	3	50	1	54	780	1,095	18	1,893	15,269
Fulton	--	1	--	1	--	1	--	1	W
Greene	15	26	--	41	8,158	950	--	9,109	100,067
Indiana	29	49	8	86	6,767	1,624	66	8,456	72,629
Jefferson	5	39	5	49	48	1,267	61	1,376	10,108
Lawrence	--	16	4	20	--	525	15	540	3,353
Lycoming	--	3	--	3	--	127	--	127	W
Mercer	--	3	--	3	--	319	--	319	W
Somerset	20	64	8	92	1,382	2,310	86	3,777	25,699
Tioga	--	1	--	1	--	662	--	662	W
Venango	--	9	--	9	--	361	--	361	1,852
Washington	17	13	2	32	12,476	1,085	29	13,589	145,941
Westmoreland	7	27	--	34	1,862	518	--	2,380	20,749
Total [1]	159	622	55	836	49,133	26,264	542	75,939	694,267

W Withheld to avoid disclosing individual company confidential data; included in "Total."
[1] Data may not add to totals shown because of independent rounding.
[2] Value received or charged for coal f.o.b. mine.

Lamps used in underground mines, according to DER data, totaled 24,781 and comprised one open-type, 4,699 flame-safety-type, and 20,081 electric-type. DER reported 19 fatalities relevant to deep mines comprising eight by roof falls, five by transportation, one by machinery, one by electricity, one by outside machinery, and three by outside transportation.

Table 15 shows DER data relating to production from underground mines, classified as gaseous or nongaseous by various coal beds.

Table 16 compares bituminous coal productivity data for 1971 and 1972, based on DER's summarized reports.

Table 17 contains bituminous coal strip and auger mining data.

Table 18 summarizes data for underground fuel-coal-producing mines permanently abandoned in 1970, 1971, and 1972 with reasons for the permanent closure. Data for this table and the reasons for permanent abandonment were obtained from the Mining Enforcement and Safety Administration, U.S. Department of the Interior.

Gulf Resources & Chemical Corp. expanded strip-mining operations in Clarion County to attain a minimal annual production of 1 million tons of steam-grade coal by mid-1972. The operations were handled by the Vantage Coal Corp., a newly formed subsidiary of Gulf Resources. Another subsidiary, The C & K Coal Co., Clarion, operated 11 widely scattered pits, known as the Fox mine, in the Rimersburg-Sligo area of Clarion County and coal-cleaning plants at Rimersburg and Piney Fork, and was the largest strip-mined coal producer in the State. Most C & K's overburden drilling was done by two truck-mounted drills.

The Markle-Bullers Coal Co., Kittanning, a producer of high-sulfur steam-grade coal, closed its mine because of environmental regulations limiting the emission of sulfur dioxide from the combusion of high-sulfur-content coal.

Westrans Industries, Inc., New York City, in June acquired the privately owned Kristianson & Johnson Coal Co., Lansc, Pa., who mined coal at two separate locations in Clearfield County, and held, on a fee-and-lease basis, 20,000 acres of coal land in four central Pennsylvania counties. Westrans, a natural resources company, was engaged in oil and gas exploration and development, coal production, and natural gas transmission.

Development work was started at United State Steel's new Dilworth mine located near Rice's Landing, 65 miles south of Pittsburgh on the Monongahela River. Mine development was speeded by use of a 17-foot-diameter boring machine to open two slopes to the coal seam. The mine, expected to begin production in late 1974, eventually will produce 4 million tons per year of metallurgical-grade coal. The project will have raw-coal-handling facil-

Table 15.—Pennsylvania: Underground bituminous coal mine data

Coalbed (Geological name)	Thickness (inches)		Mine classification		Production (thousand tons)	Acres mined [1]
	Range	Average	Gaseous	Non-gaseous		
Brookville	42–72	56	--	4	682	203
Freeport	46–78	62	1	1	587	158
Double Freeport	--	84	3	--	1,854	368
Lower Freeport	29–66	42	3	18	2,766	1,098
Thick Freeport	96–108	102	2	--	1,196	195
Upper Freeport	27–66	46	9	16	7,915	2,868
Lower Kittanning	28–78	43	13	24	8,162	3,164
Middle Kittanning	32–48	41	--	4	255	104
Upper Kittanning	32–72	46	3	21	1,598	579
Upper and Lower Kittanning	--	48	1	--	912	317
Miller "B"	--	34	--	1	39	19
Pittsburgh	62–108	75	24	11	22,019	4,893
Redstone	42–48	47	1	2	1	[2]
Sewickley	48–60	55	2	5	1,097	332
Total	--	--	62	107	[3] 49,083	14,298

[1] At 720 tons production per acre-foot.
[2] Less than ½ acre.
[3] Comprises 17,667 from 124 drift mines, 19,080 from 29 slope mines, and 12,336 from 16 shaft mines.

Note: All data in this table were derived from annual reports, published by the Anthracite and Bituminous Division of the Pennsylvania Department of Environmental Resources, that summarize mandatory monthly reports submitted by the bituminous industry.

Table 16.—Pennsylvania: Bituminous coal productivity data, 1971–72

Activity	Production (thousand short tons)		Man-days (thousands) [1]		Productivity: Tons per man-day		Percent change
	1971	1972	1971	1972	1971	1972	
Underground:							
Captive (mined and cleaned):							
Mining	21,857	20,943	2,023.6	2,179.0	10.80	9.61	— 11.0
Cleaning and preparation	21,857	20,943	161.6	179.2	135.25	116.87	— 13.6
Total or average	21,857	20,943	2,185.2	2,358.2	10.00	8.88	— 11.2
Noncaptive (mined and cleaned):							
Mining	16,480	23,349	1,323.2	1,852.7	12.45	12.60	+ 1.2
Cleaning and preparation	16,480	23,349	101.1	143.7	163.01	162.48	— .3
Total or average	16,480	23,349	1,424.3	1,996.4	11.57	11.70	+ 1.1
Noncaptive (mined and crushed):							
Mining	6,019	4,792	492.6	441.7	12.22	10.85	— 11 2
Crushing [2]	6,019	4,792	29.5	10.0	204.03	479.20	+134.9
Total or average	6,019	4,792	522.1	451.7	11.53	10.61	— 8.0
Strip:							
Noncaptive (mined and cleaned):							
Mining	10,241	11,061	430.6	444.1	23.78	24.91	+ 4.8
Cleaning and preparation	10,241	11,061	66.5	81.2	154.00	136.22	— 11.6
Total or average	10,241	11,061	497.1	525.3	20.60	21.06	+ 2.2
Noncaptive (mined and crushed):							
Mining	16,415	14,656	690.5	586.7	23.77	24.98	+ 5.1
Crushing [2]	16,415	14,656	80.4	45.4	204.17	322.82	+ 58.1
Total or average	16,415	14,656	770.9	632.1	21.29	23.19	+ 8.9

Auger:							
Noncaptive (mined and cleaned):							
Mining	59	20	1.6	0.5	36.88	40.00	+ 8.5
Cleaning and preparation	59	20	.4	0.2	147.50	100.00	— 32.2
Total or average	59	20	2.0	0.7	29.50	28.57	— 3.2
Noncaptive (mined and crushed):							
Mining	500	519	13.4	12.6	37.31	41.19	+ 10.4
Crushing [2]	500	519	2.5	1.2	200.00	432.50	+116.3
Total or average	500	519	15.9	13.8	31.45	37.61	+ 19.6
Refuse bank recovery:							
Mining	NA	523	NA	[e] 2.7	NA	193.70	NA
Cleaning and preparation	NA	523	NA	[e] 3.7	NA	141.35	NA
Total or average	NA	523	NA	6.4	NA	81.72	NA
Total captive and noncaptive:							
Mining	71,571	75,863	4,975.5	5,520.0	14.38	13.74	— 4.5
Cleaning and preparation	48,637	55,896	329.6	408.0	147.56	137.00	— 7.2
Crushing [2]	22,934	19,967	112.4	56.6	204.04	352.77	+ 72.9
Total or average	71,571	75,863	5,417.5	5,984.6	13.21	12.68	— 4.0

[e] Estimated. NA Not available.
[1] Includes personnel engaged in maintenance, haulage, land surface reclamations, etc.
[2] Includes crushing, sizing, and loading as normally performed at tipples.

Note: All data in this table were derived from annual reports, published by the Anthracite and Bituminous Division of the Pennsylvania Department of Environmental Resources, that summarize mandatory monthly reports submitted by the bituminous industry.

Table 17.—Pennsylvania: Bituminous coal strip and auger mining data, 1972

Pennsylvania district number	Strip-mining operations					Combined strip and auger operations								
						Strip mining					Auger mining			
	Operating companies	Active mining permits	Backfilling operations	Completion of operations	Production (short tons)	Operating companies	Active mining permits	Backfilling operations	Completion of operations	Production (short tons)	Active mining permits	Completion of operations	Production (short tons)	Total production (short tons)
30	20	37	5	--	1,005,683	2	10	--	--	265,048	4	--	53,738	1,324,469
31	6	7	--	--	183,485	4	20	--	3	417,441	11	--	48,101	649,027
32	31	48	3	4	1,326,672	1	11	--	4	701,457	1	--	24,061	2,052,190
33	37	76	16	--	895,380	--	--	--	--	--	--	--	--	895,380
34	34	51	1	5	1,096,838	--	--	--	--	--	--	--	--	1,096,838
35	21	37	--	--	1,129,990	14	37	--	--	1,216,047	16	--	117,989	2,464,026
36	22	74	--	--	4,111,853	--	--	--	--	--	--	--	--	4,111,853
37	15	28	4	8	674,116	--	--	--	--	--	--	--	--	674,116
38	23	40	--	--	843,782	5	21	--	--	430,551	7	--	48,194	1,322,527
39	24	40	--	5	1,136,159	6	23	--	2	493,405	8	2	66,142	1,695,706
40	22	49	2	--	1,131,410	--	--	--	--	--	--	--	--	1,131,410
41	14	24	6	4	510,025	8	21	3	2	563,760	9	1	84,680	1,158,465
42	14	32	6	5	764,592	1	1	--	--	65,001	1	--	7,060	836,653
43	10	30	4	5	852,180	4	11	3	5	220,857	5	4	36,266	1,109,303
44	27	51	1	--	1,411,433	--	--	--	--	--	--	--	--	1,411,433
45	22	63	--	--	2,283,903	2	2	--	--	51,410	2	--	23,316	2,358,629
46	10	15	--	--	314,344	4	13	--	--	258,195	7	--	29,011	601,550
47	12	37	4	9	1,362,023	--	--	--	--	--	--	--	--	1,362,023
Total	[1] 364	[2] 739	51	45	21,033,868	[3] 51	[2] 170	6	16	4,683,172	[4] 71	7	538,558	26,255,598

[1] Includes 298 individual companies, some of which operated in more than 1 district.
[2] Includes backfilling operations and completions.
[3] Includes 46 individual companies, some of which operated in more than 1 district.
[4] Includes completions.

Note: All data shown in this table were derived from information contained in the Annual Report, published by the Anthracite and Bituminous Division of the Pennsylvania Department of Environmental Resources, which summarizes mandatory monthly reports submitted by the bituminous industry.

Table 18.—Pennsylvania: Underground fuel-coal-producing mines permanently abandoned, 1970–72

County and year abandoned	Size range (thousand tons per year)	At time of abandonment: Mines closed	Annual production rate, (thousand tons)	Number of employees	Number of mines closed, reason for closure,[1] and production in thousand tons
Allegheny:					
1970	+250	1	299	69	1—f—299.
1970	50	1	12	5	1—c—12.
1972	100–250	1	138	30	1—f—138.
Total	--	3	449	104	1—c—12; 2—f—437.
Armstrong:					
1970	100–250	1	184	26	1—f—184.
1970	50	2	32	22	2—f—32.
1972	50–100	2	161	41	1—e—92; 1—f—69.
Total	--	5	377	89	1—e—92; 4—f—285.
Butler:					
1970	50	1	3	4	1—f—3.
1971	+250	1	276	52	1—d—276.
1972	100–250	1	173	20	1—f—173.
1972	50–100	1	92	22	1—f—92.
Total	--	4	544	98	1—d—276; 3—f—268.
Cambria:					
1970	50	6	12	14	2—b—4; 1—c—3; 2—d—4; 1—f—1.
1971	100–250	1	108	35	1—f—108.
1971	50	8	14	25	3—c—3; 4—d—10; 1—f—1.
Total	--	15	134	74	2—b—4; 4—c—6; 6—d—14; 3—f—110.
Clearfield:					
1970	100–250	1	106	10	1—e—106.
1970	50	1	35	15	1—e—35.
1971	50	1	7	17	1—e—7.
1972	+250	1	300	24	1—f—300.
1972	50	1	46	22	1—d—46.
Total	--	5	494	88	1—d—46; 3—e—148; 1—f—300.
Elk: 1970	50	2	29	9	2—d—29.
Indiana:					
1970	100–250	1	205	36	1—f—205.
1970	100–250	1	200	24	1—f—200.
1971	100–250	1	165	70	1—b—165.
1971	100–250	1	228	24	1—f—225.
1971	50–100	1	58	12	1—e—58.
1971	50	2	1	28	2—f—4.
1972	50–100	1	70	11	1—a—70.
1972	50	2	20	20	1—b—12; 1—d—8.
Total	--	10	947	225	1—a—70; 2—b—177; 1—d—8; 1—e—58; 5—f—634.
Jefferson:					
1970	100–250	1	149	41	1—f—149.
1970	50	1	6	3	1—f—6.
1971	100–250	1	161	43	1—e—161.
1971	50	1	1	3	1—f—1.
1972	100–250	1	120	50	1—e—120.
Total	--	5	437	140	2—e—281; 3—f—156.
Somerset:					
1970	50	5	27	11	3—a—13; 2—d—14.
1971	100–250	1	140	13	1—f—140.
1971	50	3	28	36	1—a—2; 2—f—26.
1972	50	2	46	22	1—d—39; 1—f—7.
Total	--	11	241	82	4—a—15; 3—d—53; 4—f—173.
Washington:					
1972	50	1	46	7	1—f—46.
Westmoreland:					
1970	50	1	5	2	1—d—5.

See footnotes at end of table.

Table 18.—Pennsylvania: Underground fuel-coal-producing mines permanently abandoned, 1970–72—Continued

County and year abandoned	Size range (thousand tons per year)	At time of abandonment: Mines closed	Annual production rate, (thousand tons)	Number of employees	Number of mines closed, reason for closure,[1] and production in thousand tons
State:					
1970	+250	1	299	69	1—f—299.
1970	100–250	5	844	137	5—f—844.
1970	50–100	--	--	--	--
1970	50	20	161	85	4—a—20; 2—b—4; 2—c—15; 6—d—45; 1—e—35; 5—f—42.
Subtotal	--	26	1,304	291	4—a—20; 2—b—4; 2—c—15; 6—d—45; 1—e—35; 11—f—1,18
1971	+250	1	276	52	1—d—276.
1971	100–250	5	802	185	1—b—165; 1—e—161; 3—f—476.
1971	50–100	1	58	12	1—e—58.
1971	50	15	51	109	1—a—2; 3—c—3; 4—d—10; 1—e—7; 6—f—29.
Subtotal	--	22	1,187	358	1—a—2; 1—b—165; 3—c—3; 5—d—286; 3—e—226; 9—f—505.
1972	+250	1	300	24	1—f—300.
1972	100–250	3	431	100	1—e—120; 2—f—311.
1972	50–100	4	323	74	1—a—70; 1—e—92; 2—f—161.
1972	50	6	158	71	1—b—12; 3—d—93; 2—f—53.
Subtotal	--	14	1,212	269	1—a—70; 1—b—12; 3—d—93; 2—e—212; 7—f—825.
Grand total	--	62	3,703	918	6—a—92; 4—b—181; 5—c—18; 14—d—424 6—e—472; 27—f—2,5

[1] a—1969 Coal Mine Health and Safety Act.
b—Market conditions or inferior product.
c—Personnel problems.
d—Economic conditions.
e—Adverse mining conditions.
f—Mine worked out.

ities, a river harbor, barge-loading equipment, and service and supply buildings. A barge unloader and a raw coal conveyor belt system will also be built at United States Steel's Robena mine preparation plant 12 miles from the Dilworth mine.

Jones & Laughlin Steel Corp. (J & L) started a $11 million program to substantially increase production and to extend the life of its Vesta No. 5 mining complex at Vestaburg, Washington County. Mining operations will be extended into a new coal reserve, a modern conveyor belt system will be built, at least one longwall mining system will be installed, and a new portal and surface facilities will be located near Scenery Hill. Coal production will be increased from the current 2,500 tons per day to about 5,200 tons per day. As the complex is further developed, production in 1980 should be about 10,000 tons per day.

New bituminous coal preparation facilities contracted in 1972 for Pennsylvan mines included a complete 20,000-ton-cap city storage and reclaim facility at Barne boro; 200-ton-per-hour-capacity cleanir equipment at the No. 6 plant of the Be jamin Coal Co.; a new 1,000-ton-per-hou cleaning plant scheduled for completic in late 1973 for Duquesne's Warwick min Greensboro, Greene County; a $1.8 millic modernization of the Mathies Coal C preparation plant near New Eagle; 250-to per-hour-capacity heavy media equipmer for Penn-Allegheny Coal Co., Millersvill a 300-ton-per-hour-capacity storage and r claim facility for Penn-Allegheny at Tare tum; a heavy media separator, pumps, fee ers, and screens for PBC Coals, Inc., Some set County; and a complete preparatic and storage facility including a Williams Green feeder, a rotary breaker, and radial 400-ton-per-hour stacker for tl Fisher Mining Co., Williamsport.

To obtain information in establishing mission standards for coal cleaning plants, using air tables, York Research Corp. conducted tests under EPA supervision at the Florence Mining Co. plant in Indiana County.

At a September 7 meeting in Pittsburgh sponsored by The Keystone Coal Producers Association (KCPA) and DER, about 100 deep mine operators expressed strong opposition to any plan requiring the return of coal waste underground because such disposal would be expensive, dangerous, and unnecessary. One operator claimed that underground disposal of coal waste would increase the cost of salable coal by $1.25 per ton. Other operators stated that the use of 150 to 200 tons of fly ash per surface acre of coal waste dumps would make the surface suitable for establishing cover vegetation.

Aerial surveys, followed by surface inspections by Bureau of Mines personnel, were made at 10 coal refuse dams in western Pennsylvania. It was concluded that one of the dams was in immediate danger of collapsing, barring extreme weather conditions.

The DER rejected the application of RG, Inc., New Eagle, Washington County, strip-mine bituminous coal adjacent to ingo Creek Park. The denial was important because the decision was based on the atural Resources and Public Estate nendment to the Pennsylvania Constitution even though the application fulfilled e requirements of the Surface Mining and ean Streams Law. DER also denied the plication of Compass Coal Co., Inc., to rip-mine bituminous coal on the watered of the public water supply for the y of DuBois.

The U.S. Third Circuit Court of Appeals, iladelphia, in November reversed a ruling the U.S. District Court, Pittsburgh, that joined miners from striking United ates Steel's Maple Creek mine in Washgton County. United States Steel previously had argued successfully in the S. District Court that the walkout over alleged safety hazard violated the soft al wage agreement of 1968. More than 00 miners at 10 establishments of four al companies in southwestern Pennsylnia were idle in late June despite a U.S. strict Court order against picketing at ne mines following protests based on the spension of three men for alleged safety olations. Reportedly, the estimated value of lost production was $1.2 million at a Bethlehem Mines Corp. mine, $150,000 at the Clyde mine of the Republic Steel Corp., and $250,000 per day at United States Steel mines. Coal production at these mines was partially resumed June 28.

A strike that began with 55 coal strip mine workers of Penn-Pocahontas Coal Co., Garrett, Somerset County, eventually involved 1,500 employees at The Bird Coal Co., Somerset County, Bethlehem's Nanty Glo Mine, Indiana County, and the North American Coal Corp.'s mining complex at New Florence, Westmoreland County. Reportedly, the walkout at Penn-Pocahontas followed the Federal Pay Board's rejection of a wage contract between the company and the UMWA that increased wages in conformance with the master soft coal agreement.

In western Pennsylvania, 4,555 acres of strip-mined bituminous coal land were planted with 4.75 million trees, all except 300,000 of which came from State tree nurseries. About 200 acres were planted with both trees and wildlife shrubs. Permanent grasses were planted on 3,825 acres on which an average of 300 pounds of 10–10–10 grade commercial fertilizer and 2 tons of screened or pulverized limestone was applied per acre.

Mine water treatment methods at Duquesne's Warwick Mine No. 2 and total costs per 1,000 gallons treated were reported.[9]

The Commonwealth Court in January ruled that the Pittsburgh Coal Co. and the Harmar Coal Co. were not responsible for treating mine drainage originating in adjacent abandoned mines. The DER contended that the separate decisions would harm its mine drainage program. The Court agreed to review both cases.

The DER signed three agreements in April for sealing and leveling the Wildwood mine refuse bank adjacent to North Park beginning May 15. The operator and owner of the mine, Butler Consolidated Coal Co., furnished $85,000, and a Wildwood Center development firm agreed to contribute $15,000 for the project. A nine-hole golf course will be located on the restored area.

The Leechburg Mining Co., Armstrong County, entered into a consent agreement June 27 with DER's Environmental Hear-

[9] Draper, J. C., and R. E. McHugh. Warwick Mine No. 2 Water Treatment Min. Cong. J., v. 58, No. 8, August 1972, pp. 24–28.

ing Board to take corrective actions satisfying air and water pollution regulations. In December, DER filed an injunction suit claiming violations of its environmental regulations and asking that the company post a $1,250,000 bond to insure compliance. The Commonwealth Court scheduled a review of the charges January 15, 1973.

Five grades of coal were converted to nonpolluting oils by the Bureau of Mines Energy Research Center in Bruceton. The Center was building a 50-pound-per-hour pilot plant to replace 5- to 10-pound-per-hour equipment initially used in developing a coal liquefaction and hydrodesulfurization process. The Center held a meeting October 6 to review its research on fuels and pollution control and to exchange ideas with academic and industrial energy technologists.

Groundbreaking ceremonies were held July 27 at Homer City for a pilot plant to convert different types of coal into pipeline-quality gas. The plant, the first of its type, is a joint venture of the Office of Coal Research (OCR) of the Department of the Interior and BCR. Two-thirds of the plant's $19 million cost will be funded by OCR and one-third by AGA. The plant's 36-acre site was donated by the Indiana County Development Association. In the BCR-developed BI-GAS process, pulverized coal is contacted with oxygen and steam at high temperature and pressure, and the resulting gases are freed of acidic gases before methanation. The pilot plant is designed to produce 100,000 standard cubic feet per hour of pipeline-quality gas from 5 tons of coal. A commercial plant would require 12,000 tons per day of coal to produce 250 million standard cubic feet per day (scfd). BCR selected Stearns-Roger, Inc., Denver, Colo., to engineer, build, and operate the pilot plant.

A coal gasification pilot plant for the Bureau of Mines Synthane process was announced. The $9.7 million plant will be built at Bruceton by the Rust Engineering Div., Wheelabrator-Frye Inc. The plant, due for completion in August 1974, will provide for the testing of alternate designs.

Three contracts were developed by the DER's Bureau of Occupational Health (BOH) with the National Institute for Occupational Safety & Health (NIOSH) of the Department of Health, Education, and Welfare. They were the asbestos-beryllium contract for an in-depth study of these hazards, the coal handlers' study for the environmental and medica evaluation of workers' exposures to coa dust in locations other than in coal mines and a contract to train Federal plant in spectors for the National Surveillance Net work Program within NIOSH. The Federa $118,432 involvement benefited DER mone tarily and was an adjunct to BOH person nel.

In 1972, the DER's Deep Mine Safet (DMS) function advanced from the div sion to bureau level when DMS was mad responsible for safety not only in coa mines but in metal and nonmetal mine as well. The DMS inspection force was in creased 20% following the reorganizatio of 24 underground bituminous mining dis tricts into 27 districts. DMS reevaluate the organization of anthracite districts t respond to changes in mining operations

Conflicts between DER and Federal safet requirements were compared by th Bureau of Mines Deputy Director of Healt and Safety in a June session in Pittsburgh Differences included the use of flame safet lamps to detect methane instead of an elec tronic detector to measure concentration below 0.25 volume-percent, the level tha cannot be exceeded under Federal law cleanup procedures to reduce the consump tion of rock dust; and the use of conveyo belt entries for ventilation purposes, practice banned by the Bureau of Mines It was clearly stated that Federal requirc ments would take precedence.

In the 1972 National Safety Competitio sponsored by the American Mining Con gress and the Bureau of Mines, the to winner in the underground coal group wa the Robena No. 1 mine, Frick District United States Steel Corp., Carmichael Pa., because of 740,496 man-hours worke without a disabling injury.

According to the March 1973 Keyston Coal Industry Manual, Pennsylvania ha 13 of the country's 128 bituminous coa mines that produced more than 1 millio tons apiece. The 13 mines in Pennsylvani produced 9.7% of the 250.27-million-ton pro duction from the 128 mines. Data in tabl 19 shows the production and national ran of the 13 mines.

Coke.—Pennsylvania ranked first in oven coke production with 27% of the U.S. pr duction. Nine companies operated 12 over coke plants, of which three were classifie as merchant and 10 as furnace. Total coa received by the 12 plants was 23,018,00 tons and comprised 2,292,000 tons fro

Table 19.—Pennsylvania: Plus-million-ton-production bituminous coal mines, 1972

Company	Name of mine	Type of Mine	Production (thousand tons)	National rank [1]
United States Steel Corp	Robena	Captive, deep	3,008	13
Florence Mining Co	No. 1	Deep	2,327	28
C & K Coal Co	Fox	Strip	2,300	30
Mathies Coal Co	Mathies	Deep	2,205	32
United States Steel Corp	Maple Creek	Captive, deep	2,062	38
Rochester and Pittsburgh Coal Co	Jane	Deep	1,999	40
Pittsburgh Coal Div., Consolidation Coal Co.	Montour No. 4	Deep	1,935	45
Duquesne Light Co	Warwick	Captive, deep	1,714	56
Gateway Coal Co	Gateway	Captive, deep	1,599	63
Helvetia Coal Co	Lucerne No. 6	Deep	1,365	87
Bethlehem Mines Corp	Marianna No. 58	Captive, deep	1,354	88
Do	Somerset No. 60	Captive, deep	1,332	90
Do	Ellsworth No. 51	Captive, deep	1,088	116

[1] Based on production

Kentucky mines, 11,904,000 from Pennsylvania mines, 752,000 from Virginia mines, and 8,070,000 from West Virginia mines. The 12 plants carbonized 22,764,000 tons of bituminous coal and 122,000 tons of anthracite to produce 15,869,000 tons of breeze-free metallurgical coke of which 97.7% was blast furnace grade valued at $37.29 (average) per ton. The 13 plants also produced 777,000 tons of coke breeze, and byproducts comprising fuel gas, nitrogenous compounds, tar, naphthalene, pitch, and crude light oil and its derivatives.

The number of operating coke oven batteries in Pennsylvania and the number of ovens in each battery at yearend were—

Plants	*Batteries*	*Ovens*
Jones & Laughlin—Aliquippa	3	271
Jones & Laughlin—Pittsburgh	4	315
Bethlehem Steel—Bethlehem	6	372
Bethlehem Steel—Johnstown	3	228
Bethlehem Steel—Johnston (Rosedale)	1	88
Crucible Steel—Midland	3	113
United States Steel—Clairton	20	1,375
United States Steel—Morrisville	2	174
Interlake—Erie	2	58
Wheeling—Pittsburgh Steel—Moneseen	2	93
Shenango—Pittsburgh	3	105
Alan Wood—Conshohocken	2	110
Philadelphia Coke—Philadelphia	1	74
Total	52	3,376

Four beehive coke plants operated by four companies in Armstrong, Fayette and Indiana Counties carbonized 297,000 tons of bituminous coal, all from Pennsylvania mines, and produced 160,000 tons of coke, 99.9% of which was blast furnace grade. The average coke yield for the four plants was 53.9 weight %.

Coke exports through Philadelphia totaled 81,677 short tons compared with 54,556 tons in 1971.

According to the Eastern Gas and Fuel Associates Annual Report, demand for foundry coke remained strong throughout 1972, but deliveries by the firm's merchant coke plant in Philadelphia were less than in 1971 because of wind damage to a conveyor-system gallery, which resulted in limited operations for about eight weeks early in the year. Total production was 266,000 tons of foundry coke and 57,000 tons of smaller sizes. Exports of coke were restricted in order to satisfy domestic demands.

Effective with December 18 shipments, Shenango, Inc., increased its price for foundry coke $2.50 to $56.75 per net ton f.o.b. ovens at Neville Island. The rising cost was attributed to higher prices for coking coal, increased labor rates, and compliance with environmental control standards.

The Bortz Coal Co., an operation of beehive coke ovens in Smithfield, Fayette County, in late June lost its appeal to overturn a pollution citation issued by DER. The company was ordered to install pollution control devices by September 1 or face court action leading to an injunction.

At yearend 1970, J & L operated five diesel-powered towboats and about 225 barges to transport more than 5 million tons of coal per year from its mines in Washington and Greene Counties to its coke plants in Pittsburgh and Aliquippa.

Natural Gas Liquids.—Proved reserves at yearend totaled 735,000 42-gallon barrels.[10]

Capacity of the two natural gas processing plants, operated by the Mars Co., as of January 1, 1972, was 8 million cubic

[10] Oil and Gas Journal. U.S. Reserves Skid Again: Both Oil and Gas Down Sharply. V. 71, No. 13, Mar. 26, 1973, p. 54.

feet per day. In 1971, daily production from these two plants totaled 6,300 gallons comprising 3,000 gallons of propane, 1,200 gallons of butane, and 2,100 gallons of debutanized natural gasoline.[11]

Compared with 1971, the quantity of natural gas liquids produced was 35.9% greater and its total value was 33.9% greater.

Peat.—At least 90% of the peat found in Pennsylvania occurs in areas north of the glacial terminal moraine.

Nine operations in six counties reported a total production of 23,136 short tons, 40.5% less than in 1971. Of the total production, 1,000 tons was shredded and kiln dried, 1,075 tons was kiln dried only, and 21,061 tons was shredded only. Luzerne County was the leading producer, followed by Erie County. Other producing counties were Columbia, Lackawanna, Lawrence, and Monroe.

Sales totaling 22,416 tons, at an average value of $14.28 per ton, were 30.6% less and averaged $2.22 per ton more than in 1971. Sales of bulk peat for general soil improvement totaled 15,473 tons and averaged $13.40 per ton. Total sales and average value by type was as follows: 4,295 tons of moss peat at $14.98 per ton, 16,661 tons of reed-sedge peat at $13.64 per ton, and 1,460 tons of humus at $19.71 per ton.

Petroleum and Natural Gas.—Crude petroleum production was 10% less than that in 1971. The Oil and Gas Division, Pennsylvania Bureau of Topographic and Geologic Survey, reported that Pennsylvania-grade crude production totaled 3.36 million barrels valued at $16.16 million, with an additional 78,000 barrels, 13,000 more than in 1971, of Corning-grade crude oil, valued at $255,400, produced in Crawford County from the Medina (Lower Silurian) Sandstone. The number of producing wells decreased from 34,029 in 1971 to 32,596 at yearend 1972. Estimated proved recoverable reserves of crude oil at yearend totaled 36.7 million barrels, a decrease of 10.3 million barrels from that of yearend 1971. Natural gas production totaled approximately 74 billion cubic feet (Bcf), a decrease of 3% from that of 1971. A total of 61.8 Bcf of gas was produced from shallow (upper Devonian or younger) reservoirs, while production from deep (Middle Devonian or older) reservoirs totaled 12.1 Bcf. The estimated number of producing gas wells remained about the same as in 1971 at 16,600. Estimated proved reserves of natural gas totaled 1,407 Bcf, including 607 Bcf in storage at yearend. This was an increase of 11 Bcf from that of 1971.

The Oil and Gas Division reported 948 new wells being drilled and 34 wells being deepened during 1972. Of these, 517 were oil wells, 284 gas, 16 oil and gas, 55 service, 13 gas storage, and 63 dry holes. Of the old wells drilled deeper, 13 were gas, one oil, 13 gas storage, and seven dry. Total footage of all wells (982) drilled was 1,922,319. Of 901 well completions (excluding service and gas storage wells) 66 were exploratory (35% successful) and 835 were development (98% successful), an increase of 77% and 3% respectively. Deep drilling (Middle Devonian or older) decreased from 106 wells in 1971 to 63 wells in 1972 including 12 wells drilled deeper. As in 1971, the majority of deep development drilling was in the Medina gas area of Crawford County where eight gas wells, four oil and gas wells, and one dry hole were drilled in the Indian Springs field. The two wells producing oil had initial productions of 40 barrels per day of Corning grade crude. Most of the activity in shallow gas fields was in the following counties: Indiana 159 gas wells; Armstrong 24, and Jefferson, 24. The majority of the shallow oil development was carried on in the following counties: Venango, 211 wells producing from the Red Valley and Venango Second sandstones; Warren, 127 oil wells with Glade sand production; Forest, 108 wells with production from the Red Valley and Venango Second sandstones; and McKean, 74 wells producing from the Bradford and associated sandstones. Seismic activity was at an alltime high during the year with most of it being vibroseis. Seismic crews logged 263 crew-weeks, costing operators over $4 million during 1972, compared with 147 crew-weeks during 1971, an increase of 79%. The seismic surveys were made in Armstrong, Beaver, Bedford, Blair, Bradford, Bucks, Cambria, Cameron, Centre, Clarion, Clearfield, Clinton, Elk, Erie, Fayette, Forest, Fulton, Greene, Indiana, Jefferson, Lycoming, McKean, Pike, Potter, Somerset, Sullivan, Susquehanna, Tioga, and Washington Counties, 29 of the 67 counties in the State.

Two expanded Maraflood projects con-

[11] Oil and Gas Journal. 1972 Survey of Gas-Processing Plants. V. 70, No. 28, July 10, 1972, pp. 91, 112.

Table 20.—Pennsylvania: Oil and gas well drilling completions, by county

County	Proved field wells [1]			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Wells	Footage
Allegheny	--	1	1	--	--	--	2	7,369
Armstrong	--	25	2	--	1	--	28	93,883
Beaver	--	1	--	--	--	--	1	1,017
Bedford	--	--	--	--	--	3	3	15,235
Bradford	--	--	--	--	--	1	1	5,290
Butler	2	1	--	--	--	--	3	5,496
Cambria	--	1	--	--	--	3	4	26,971
Cameron	--	2	--	--	1	7	10	55,416
Clarion	2	4	--	--	--	3	9	22,013
Clearfield	--	10	--	--	4	--	14	45,975
Crawford	4	8	1	--	--	--	13	45,731
Elk	3	1	--	--	2	2	8	25,571
Erie	--	4	--	--	--	2	6	18,280
Fayette	--	5	1	--	--	--	6	25,984
Forest	108	3	--	--	--	1	112	99,923
Greene	--	2	2	--	--	--	4	7,870
Indiana	--	159	5	--	8	3	175	596,378
Jefferson	--	24	--	--	--	1	25	80,597
Luzerne	--	--	--	--	--	1	1	4,595
McKean	74	3	8	1	2	2	90	167,092
Mercer	--	1	--	--	--	4	5	21,387
Pike	--	--	--	--	--	1	1	13,910
Potter	--	1	--	--	1	1	3	13,922
Somerset	--	--	--	--	--	1	1	4,904
Tioga	--	--	--	--	--	2	2	12,508
Venango	211	2	4	--	--	4	221	181,184
Warren	127	1	3	2	--	--	133	125,054
Washington	--	1	--	--	--	--	1	2,215
Wayne	--	--	--	--	--	1	1	12,250
Westmoreland	--	17	--	--	1	--	18	66,190
Total	531	277	27	3	20	43	901	1,804,210

[1] Development wells as defined by American Petroleum Institute.
Source: American Petroleum Institute.

inued operation, one in McKean County n the Third Bradford sand, and the other n Venango County in the Venango First and.

The wellhead price of new natural gas in- reased to 45 cents per 1,000 cubic feet, 15 ents more than a year earlier. Effective)ecember 1, the wellhead price of Pennsyl- ania-grade crude oil increased 60 cents per arrel. This crude was priced at $5.48 per arrel in the Bradford district, $5.20 in he Middle district, and $4.77 in the South- estern district. Corning-grade crude oil n Erie and Crawford Counties advanced) $3.82 per barrel. The basic Bradford istrict price of $5.48 was the highest nce 1920 when the price was $5.97 per bar- el. The next highest price prior to 1920 was 5.64 in 1869. Although the 60 cent price ncrease affected less than 1% of the coun- y's 9.5-million-barrel-per-day crude pro- uction, the increase offered to Pennsyl- ania-grade producers, incentive to find new eserves.

According to the American Gas Associa- on, Pennsylvania, as of December 31, 1971, ad 66 dry gas reservoirs, rated at 752.7 f capacity, equal to 13.9% of the total .S. gas reservoir capacity. The reservoirs ere serviced by 2,135 wells, and had stored in them 593.8 bcf (at 14.73 psia and 60° F), or 16.9% of the total gas in all U.S. gas storage reservoirs.

Pennsylvania gas storage reservoirs received 303.3 bcf., delivered 284.5 bcf, and attained a net gain in storage of 18.8 bcf during 1971.

The Pennsylvania Game Commission did not lease any additional acreage in 1972 for exploration or development of oil and gas. At the end of 1972 the Commission had 28 active leases totaling 11,737 acres. Forty-one wells were producing on the 28 leases, 6 were acquired on new leases with land purchased, and one well was plugged and abandoned. No wells were drilled on Commission lands during the year.

Through competitive bidding, 80,458 acres of State forest or park lands were leased during 1972. The total bonus or first-year rental received for these tracts was $691,094. The average of all sales was $8.59 per acre. After the first year, the rental was $1.00 per acre per year with royalties equal to one-eighth or more of all production.

Income derived from oil and gas exploration and development on State forest and park lands totaled $1,011,494, of which royalty payments amounted to $129,225 for

1,281,141 thousand cubic feet and $882,269 for tract rentals, gas storage, rights-of-way, etc. At year end, 234,066 acres (including 59,109 acres in gas storage) of State forest and park lands were under lease for oil and gas exploration and development.

The Dowdle Oil Corp., Midland, Tex., in September completed two initial wells of its planned multiwell natural gas drilling program on 2,712 acres of oil and gas leases in Indiana County. The firm planned to drill an additional 48 wells on this acreage during the remainder of 1972 and in 1973. The No. 1 Bence well produced 1,895,000 cubic feet per day from four Devonian Age zones between 2,468 and 3,270 feet. The No. 1 Musser well produced 550,000 cubic feet per day between 2,460 and 3,310 feet in the same zones. Gas from both wells went to Peoples Natural Gas Co., of Pittsburgh, under long-term contract at an initial price of 45 cents per thousand cubic feet. Dowdle's fourth well, the No. 2 Warren, after completion in December produced 2 million cubic feet per day from four Devonian Age zones between 2,630 and 3,456 feet.

The Columbia Gas Transmission Corp. paid Trend Exploration, Ltd., $2 million for seismographic data. Columbia also leased 200,000 acres in northern Pennsylvania and southern New York.

Peoples Natural Gas Co. announced plans in January to spend $17.5 million to increase the supply of natural gas in western counties during 1972. The drilling of 43 new wells was estimated to cost $1.8 million, and $1.7 million was allocated to construct gathering lines from shallow wells in the eastern sections of the firm's service area. The cost of cleaning out and fracturing 19 existing wells was estimated as $364,000. The firm completed a 33-mile gathering line in Indiana County.

Columbia Gas Systems of Pennsylvania, in compliance with a February 1 order from the Public Utilities Commission (PUC), banned all new gas sales to residential, commercial, and industrial customers. The firm serviced 331,000 customers in 22 western counties. Peoples Natural Gas Co. and Equitable Gas Co. also turned away new customers and curtailed supplies to PPG Industries plants in Creighton and Ford City and to the Jeanette plant of ASG Industries.

The PUC on June 15 conditionally approved a 5% price increase applicable to 280,000 Equitable Gas Co. customers in eight western counties. Spokesman for United State Steel and J & L told the PUC in July that if the fuel-price increase was granted, it would cost United States Steel $500,000 and J & L $250,000 per year.

The Federal Power Commission (FPC) approved an emergency arrangement in September that allowed five major gas pipeline companies to deliver up to an additional 1.1 bcf of gas until August 1973 to the Pennsylvania Gas & Water Co., to meet a critical shortage in the flood-stricken area of Wilkes-Barre.

The FPC in August authorized Consolidated Gas Supply Corp., Clarksburg, W. Va., and Texas Eastern Transmission Corp., Houston, Tex., to build facilities costing $8.8 million at the jointly owned underground Oakford gas storage field in Westmoreland County. Included was a 12,700-horsepower (hp) compressor station that will be used to increase storage capacity by 10 bcf to 70 bcf.

Liquefied natural gas (LNG) facilities in operation included: Philadelphia Electric Company's 6.6-million-cubic-foot-per-day liquefaction plant and a storage tank with a capacity of 348,000 barrels of liquid, equivalent to 1.2 bcf of gas, and the Philadelphia Gas Work's (PGW) 16-million-cubic-foot-per-day liquefaction plant 1.2 million barrel liquid-storage capacity, equivalent to 4.0 bcf of gas.

Airco Cryoplants was constructing a LNG plant for UGI in Reading. The plant will use an expander-nitrogen cycle and was to be operable in 1973. UGI also completed, in Reading in the winter of 1971-72, a 73,000-barrel, 250-million-cubic-foot (mmcf) gas-equivalent, double-wall storage vessel constructed using 9% nickel steel. This vessel, used as a peakshaving facility, was supplied by PGW and the Boston Gas Co., Boston, Mass.

The status of substitute natural gas (SNG) reforming plants in Pennsylvania as of December 1972 was as follows. The Apco Oil Corp. proposed a 125-million-cubic-feet-per-day (mmcfd) capacity, $30 million plant to be operative at an eastern county site by 1974. The Lurgi process will be used to reform 28,000 barrels per day of naphtha. The Philadelphia Electric Company announced four, 125-MMcfd plants to reform naphtha. The first plant would be operative in 1974 followed by one plant in every fourth year

Underground gas storage operations in 1972 are shown in the following tabulation:

Company	Number of fields	Number of wells	Miles of storage lines	Storage compressor stations	
				No.	Hp
Columbia Gas of Pennsylvania, Inc	1	8	6	1	900
Duquesne Natural Gas Co	1	5	--	1	165
Equitable Gas Co	15	235	129	7	13,500
Kane Gas Light & Heat Co	1	21	10	1	60
North Penn Gas Co [1]	2	21	18	1	4,995
Pennsylvania Gas Co	8	333	108	4	9,570
Peoples Natural Gas Co [2]	8	87	32	7	10,320
Saxonburg Heat & Light Co	3	6	NA	NA	NA

NA Not available.
[1] Jointly owned.
[2] One field under development.

Source: Pipeline and Gas Journal. V. 199, No. 14, December 1972, pp. 33–36.

thereafter. The plants would be built in the Philadelphia area, and their total cost would be $150 million. PGW planned a $35 million, 100-MMcfd plant to reform naphtha in Philadelphia. The Transco Energy Co. (Transcontinental Gas Pipe Line Corp.) announced a 250-MMcfd, $85 million, Lurgi process plant to reform 53,500 barrels per day of naphtha and 4,200 barrels per day of propane. One-half of the naphtha and all of the propane will come from domestic sources. The plant will be located at Twin Oaks near Marcus Hook and will be operative in 1974 or 1975. The Howard Oil Refining Co. planned a 177-MMcfd SNG plant in Philadelphia.

Pennsylvania with a 4811.1-million-gallon consumption, ranked sixth in the top 25 gasoline-consuming States. The 10 leading companies marketing gasoline in Pennsylvania and their percentage of the total Pennsylvania market was as follows: Arco, 15.82; Exxon, 10.65; Sun, 10.19; Gulf, 8.19; Texaco, 7.94; Mobil, 7.61; American, 5.98; Phillips, 2.06; BP Oil, 1.30; and Getty, 1.28.[12]

The lubricating oil and wax producing capacities of Pennsylvania petroleum refineries as of January 1, 1973, as compiled by the National Petroleum Refiners Association, are shown in table 21, together with the manufacturing processes used for lubricating oil production. Collectively the seven lubricating oil producers in western Pennsylvania accounted for approximately six % of U.S. production.

As of January 1, 1972, seven refineries in western Pennsylvania had a total capacity to process 34,820 barrels per day of Pennsylvania-grade crude oil. Three of the seven refineries, having a 9,000-barrel-per-day total-feed capacity, also produced solid lubricants and waxes. Their daily liquid-fuels-producing capacity is unknown. Four of the seven refineries had a total crude feed capacity of 25,820 barrels per day, and their total operating and shutdown capacity to handle feedstocks for producing gasoline and other liquid fuels totaled 11,252 barrels per calendar day (bpcd). Their total operating capacity for producing gasoline and other liquid fuels totaled 7,675 bpcd, and their shutdown capacity could have produced 2,252 bpcd. These four refineries produced lubricants and waxes as their principal products.

Four major operating refineries near the Delaware River that solely processed interstate and foreign crude oils had capacity, all of which was in use as of January 1, 1972, to refine 591,300 barrels per calendar day. The four refineries had capacity to produce 317,660 barrels per calendar day of gasoline and other liquid fuel distillates. However, 6.5% of this capacity was shutdown. The daily feedstock charge and production of distillate fuels, in barrels by process was as follows:

Type of process	Charge capacity, operating and idle	Distillate fuel production capacity	
		Operating	Idle
Alkylation	42,600	26,200	--
Catalytic cracking	228,800	119,200	13,500
Catalytic refining	164,500	139,860	--
Hydrocracking	28,000	11,000	--
Thermal cracking	10,900	700	--
Thermal refining	12,000	--	7,200
Total	486,800	296,960	20,700

Pennzoil's new hydrogen plant and hydrotreater unit at the Oil City refinery were put onstream January 1. The lubricating-oil-hydrotreating process was developed by Gulf Research & Development Co. The

[12] Oil and Gas Journal. The Big Marketers in the Top 25 Gasoline-Consuming States. V. 71, No. 20, May 14, 1973, p. 30.

Table 21.—Pennsylvania: Lubricating oil and wax capacities of petroleum refineries as of January 1, 1973, by company and refinery location

(In barrels per calendar day)

	Ashland Oil Inc., Valvoline Oil Co.	Pennsylvania Refinery Co.	Pennzoil Co.		Quaker State Oil Refining Corp.		Wetco Chemical Corp., Bradford Division	Sun Oil Co.	Total
	Freedom	Karns City	Reno	Rouseville	Emlenton	Farmers Valley	Bradford	Marcus Hook	
Finished lubricating oil, capacity	1,000	300	500	3,175	1,700	2,500	1,800	16,000	26,975
Finished wax capacity [1]	×	×	×	×	×	×	×	×	
Unfinished wax capacity [2]				[3] ×	×	×	×	×	
Processes employed:									
Vacuum distillation							×		
MEK benzol dewax	×	×	×						
Propane dewax					×	×		×	
Centrifuge							×		
Furfurial extraction								×	
Phenol extraction	×	×	×	×	×	×	×		
Duo-Sol extraction		×		×					
Bauxite percolation								[3] ×	
Hydrotreating [4]	100		36	492	300	350	400	900	2,578
Hydrofinishing [5]			56	113	600	500	800		2,069

[1] Includes full refined, crude scale, and microwaxes.
[2] Includes semifinished, slack waxes (paraffin), and petrolatums.
[3] Uses toluene instead of benzol.
[4] High-pressure hydrogen processing including low to high-severity cracking.
[5] Low-temperature, low pressure catalytic finishing with hydrogen.

Bradford Petroleum Div., Witco Chemical Corp., used its staff to increase the crude capacity of its Bradford refinery by 7,500 barrels per day. The Quaker State Oil Refinery Corp.'s 6,500-bpcd refinery at Farmers Valley was closed July 27 when collective bargaining negotiations reached a stalemate. Normal operations resumed August 10, and negotiations were continued.

The United Refining Co.'s Warren refinery processed 25,000 bpcd of interstate and foreign crude oils. This refinery's capacity was 18,700 barrels per day of distillate charge, and an output capacity, none of which was idle, to produce 12,900 barrels per day of gasoline and other liquid fuels. The Warren refinery also produced asphalt. Two Merox units, designed and licensed by Universal Oil Products Co. (UOP), were installed to treat light fluid catalytic cracking (FCC) gasoline and heavy FCC gasoline.

The National Transit Co. asked the PUC for approval to increase by $400,000 annually its charges for the pipeline transportation of petroleum products effective March 21. The firm operated two, high-pressure, 6-inch lines between the West Virginia border and Pennsylvania refineries at Bradford, Emlenton, Karns City, and Rouseville. The additional revenue was needed to improve the pipelines and to begin antipollution safeguards ordered by DER. A break in one of the pipelines on April 12 released between 800 and 1,000 gallons of crude oil into a Venango County stream. Most of the oil was recovered from the stream before it entered the Allegheny River.

The Howard Oil Refining Co. planned a $200 million, 150,000-barrel-per-day (bpd) refinery to be in operation in Philadelphia in 1974.

The Atlantic Richfield Co. (ARCO) awarded the Fluor Corp. a contract in March to engineer, procure, and construct process units of a multi-million-dollar modernization program at its Philadelphia refinery. In addition to a major revision of the existing 130,000-bpd capacity crude unit, the project will add a 57,000-bpd-capacity vacuum unit, a 41,000-bpd-capacity hydrodesulfurizer unit, and a 20,000-bpd-capacity gas-oil hydrodesulfurizer unit. A 30,000-bpd-capacity high-octane-gasoline Magnaformer started operation early in 1972. In the 1965–75 period the Philadelphia refinery was expected to obtain a 75% reduction in hydrocarbon emissions from the 45.3-ton-per-day level in 1965, and sulfur dioxide emission should be reduced 91% from the 83.1-ton-per-day (tpd) level in 1965.[13]

Gulf's Philadelphia refinery in December completed a small plant that used the J. F. Pritchard & Co. process to reduce sulfur compounds in the refinery's Claus-plant tail gas to less than 300 parts per million (ppm) sulfur dioxide eqiuvalent, equal to 60% of Philadelphia County's proposed standard. The Claus unit will recover 46 long tons per day of sulfur, and the Pritchard process will recover an additional 1.5 long tons per day. A $6 million, 10-million-gallon-per-day (MMgpd) wastewaters treatment plant was completed at the refinery. A new Gulf FCC process was installed in revamped older units of the refinery. The FCC process combined the great capabilities of zeolites as catalyst and several design changes to attain high-temperature, short-contact-time, riser cracking. Reportedly, gasoline yields were increased up to 7%, and a 50% to 70% selectivity of C_3, C_4, and C_5 products was achieved.

Power Generation.—Pennsylvania electric utilities consumed 33,469,277 tons of bituminous coal and 1,583,831 tons of anthracite in 1972 and produced 5.5 million tons of ash including approximately 1.2 million tons of bottom ash and slag and 4.3 million tons of fly ash.

The utilities received 35,691,218 short tons of bituminous coal, thereby increasing stocks by 2,221,921 tons to 8,584,275 tons at yearend, equal to about an 87-day supply based on the average daily consumption in 1972.

Construction continued on the $328 million Bruce Mansfield Station of the Central Area Power Coordination Group (CAPCO) at Shippingport. The first of two 880-megawatt (MW) generating units was scheduled for operation in 1975. The plant will have an Ohio River dock to receive fuel coal, much of which will come from southern Ohio.

According to a United Gas Improvement Co. (UGI) official, no construction was started in 1972 on a 300-MW steam-electric plant in the Northern anthracite field. The plant will be fueled with upgraded

[13] Walters, R. M. How an Urban Refinery Meets Air-Pollution Requirements. Chem. Eng. Prog., v. 68, No. 11, November 1972, pp. 85–88.

culm bank material burned in Ignifluid combustion furnaces.[14]

Because of the high investment required for the proposed conversion to meet air pollution standards, Duquesne Light Co. planned to close its Brunot Island Station by April 1973.

In November, the Babcock & Wilcox Co. received a $27 million contract to build a 1,005°F coal-fired steam generating unit for the new 630-MW capacity Homer City Station of the Pennsylvania Electric Co. (PENELEC) and the New York State Electric & Gas Corp. Construction of the radiant boiler unit was planned to start in July 1, 1973, with initial startup scheduled for late 1976. The unit is a part of the $200 million joint expansion program that will bring the total investment in the Homer City Station to about $400 million.

The Delaware River Basin Commission (DRBC) disclosed a master plan submitted by electric utilities that included the following proposed fossil-fueled plants: The Philadelphia Electric Co. planned two 750-MW units at Croyden, Pa., to be operable in 1986, and the General Public Utilities Corp. (GPUC) planned two 316-MW units near New Hope, Pa., to be operable in 1980. In March, the Pennsylvania PUC ordered all electric utilities in the State to furnish data on generating capacity, forecasted load growth, customer demand, an anticipated plant construction.

Because of Agnes, Pennsylvania Power Light Co. (PPL) had $11 million in dan ages of which $7.4 million occured at i coal-fueled Brunner Island Station locate 15 miles south of Harrisburg. PPL suffere forced outages totaling about 2,100 meg watts. The Philadelphia Electric Co. ha forced outages totaling 2,114 megawatt The 1,700-megawatt Conemaugh Statio jointly owned by nine companies, had a capacity shutdown. Also affected wer PPL's 110-megawatt Holtwood Station an the 10-megawatt Lock Haven plant. PPL 52-megawatt Stanton Station near Scranto was not returned to service because it wa scheduled to be closed October 1 becaus of new air pollution regulations. Only th Portland Station, one of Metropolitan Ed son Co.'s five base-load plants, remaine in service with its normal output augi mented by 11 of its 13 peak-load gener tors. Construction activities on Metropol tan's Three Mile Island nuclear units wer not affected by Agnes' floodwaters.

The following estimates of 1972 and fu ture use of fossil fuels by some Pennsylvani electric utilities were obtained by the Ke stone News Bulletin 20th Annual Electri Utility Survey (all data are in thousand of coal equivalent tons):

	1972	1973	1974	1975	1976	198
Duquesne Light Co.:						
Coal	5,386	4,939	4,690	4,430	4,715	N.
Oil	15	52	148	152	149	N.
Pennsylvania Electric Co.: Coal	12,542	13,062	13,132	13,001	13,034	13,69
Pennsylvania Power Co.: Coal	1,003	870	NA	NA	NA	N.
Pennsylvania Power & Light Co.:						
Coal	7,050	8,568	9,222	8,831	8,773	N.
Oil	364	415	310	1,550	1,550	N.
Philadelphia Electric Co.:						
Coal	3,310	3,640	3,620	3,620	3,620	3,60
Oil	5,712	6,300	6,340	5,255	5,300	6,80
Gas	106	NA	NA	NA	NA	N.

NA Not available.

Pennsylvania nuclear plants having more than 100-MW gross capacity that were being constructed or were on order as of December 1, 1972, and all of which will use pellet-type nuclear fuel, totaled 10,163 megawatt initial gross capacity for 10 units in six plants. This amount of generating capacity if fueled by bituminous coal would require 24 to 29 million tons annually. The year of commercial operation and the distribution of the total initial gross capacity of the 10 units in megawatts follows: 1972, 1,098; 1973, 1,973; 1974, 1,782; 1975, 2,049; 1977, 1,090; 1979, 1,085; and 1981, 1,085.

Metropolitan Edison Co. reported tha total construction costs will be $750 millio for its Three Mile Island nuclear plant a Goldsboro that will use light-water reactor The first of two 850-megawatt generatin units was scheduled for operation abou May 1974 and the second unit about Ma 1976. The plant's output will be poole by 12 utility companies that supply 1 southeastern Pennsylvania counties an parts of New Jersey and Maryland.

[14] Demmy, R. H. Ignifluid Boilers for Utilities Chem. Eng. Prog., v. 68, No. 2, February 1972 pp. 68–69.

GPUC announced plans to build two ,200-MW nuclear-powered units near an xisting fossil-fueled plant at Portland, Pa., o be on line in 1981 and 1983, and one ,200-MW nuclear unit ready for operation n 1985 near Reading.

In a report submitted to the DRBC in anuary, Philadelphia Electric Co. disosed plans to build three nuclear generatng plants in addition to four other plants nder construction in 1972. The proposed lants and their location are the Eastern hester County Station on Brandywine reek; and the Upper Delaware Station and he Lower Lehigh Station, both on Tohikon reek in Bucks County. Each Bucks County lant is to have 1,500 megawatt capacity, nd their commercial operation is schedled for 1983 and 1985. Reportedly, the ompany will spend $2.2 billion for nuclear owerplants during a 5-year period. This xpenditure is about 4.4 times the comany's current annual operating revenue. n July, the company ordered four 600egawatt turbogenerators from Westingouse, that will be used with two high-temerature gas reactor (HTGR) systems to be upplied by the Gulf General Atomic Co. ivision of the Gulf Oil Corp. Commercial peration dates for the four turbogenerators nd the two HTGR systems are scheduled or 1979 and 1981 at an undertermined site. ulf General by yearend 1971 had comleted successful tests using a design prototpe HTGR system in Philadelphia Elecic Co.'s Peach Botton Station at Delta, a. The HTGR system eliminates water ermal pollution because gaseous helium used as coolant.

PPL disclosed plans for two 1,120-megaatt nuclear plants to be located at an ndetermined site near the boundary of ehigh and Bucks Counties, to be comercially operable in 1983 and 1985.

The U.S. Supreme Court on April 3 uled that States may not set more stringent adiation standards than those established y AEC. Because Pennsylvania for several ears had limited radioactive emissions to % of the amount permitted by the AEC, ie DER insisted that nuclear powerplants eet DER standards.

Three environmental groups and Pittsurgh's Mayor in a December 11 meeting bjected to the $340 million Beaver Valley uclear powerplant at Midland for environental and economic reasons. At yearend, ie plant was 60% completed.

NONMETALS

Cement.—Portland cement shipments from 20 plants in eight counties were 4.6% greater in tonnage and 11.1% greater in value because of an average increase of $1.10 per short ton compared with 1971. Masonry cement shipments from 18 plants were 7.6% greater in tonnage and 10.3% greater in value because of an average increase in value of $0.66 per short ton.

For the purpose of cement surveys the State is divided into an eastern district having five producing counties and a western district having three producing counties. The districts are separated by the eastern boundaries of Potter, Clinton, Centre, Huntingdon, and Franklin Counties. Eighteen plants operated both kilns and grinding plants, and two plants performed grinding only on interplant-transferred clinker at West Conshohocken and Plymouth Meeting.

Pennsylvania ranked second in the list of U.S. portland cement-producing States. Northampton and Lawrence Counties collectively accounted for 59.8% of the total portland cement shipments and 55.1% of the total masonry cement shipments.

The distribution of plants using wet or dry manufacturing processes was as follows:

	District	
	Eastern	*Western*
Plants using—		
Wet process	4	3
Dry process	9	2

Raw materials used in the manufacture of portland and masonry cements totaled 13,578,899 short tons and comprised 7,560,643 tons of cement rock, 4,782,796 tons of limestone, 307,944 tons of sand and sandstone, 256,826 tons of shale, 104,033 tons of clays, 110,814 tons of blast furnace slag, 12,684 tons of gypsum, and a total of 443,159 tons of bauxite, domestic and imported clinker, iron ore, and other ferrous materials.

Eighteen plants at yearend had 59 kilns with a total rated maximum 24-hour capacity totaling 26,417 short tons. These 18 plants, together with two plants performing grinding only, consumed 598,000 cubic feet of natural gas, 622,000 barrels of fuel oil, 1,658,000 short tons of bituminous coal, 25,000 short tons of anthracite, 27,242,000 kilowatt-hours of generated electricity, and 1,156,593,000 kilowatt-hours of purchased electricity.

The mode of transportation, type of packaging, and destinations of finished portland cement shipments in short to follows:

Mode of transportation	From plant to terminal		From terminal to ultimate consumer		From plant to ultimate consumer	
	Bulk	Container	Bulk	Container	Bulk	Contain
Railroad	654,527	32,702	64,111	7,122	1,388,873	186,38
Truck	75,108	3,172	700,821	23,169	5,049,167	765,00
Barge	82,248	--	--	--	29,631	--
Total	811,883	35,874	764,932	30,291	6,467,671	951,39

Portland cement consumed in the State totaled 3,276,930 short tons (39.9% of the total shipments), and 154,074 tons of masonry cements were consumed in the State (34.1% of the total shipments).

United States Steel's subsidiary, Universal Atlas Cement, closed its Penn Hills plant for 2 months to install a new clinker cooling unit that was expected to reduce dust emission by 96%.

The Whitehall Cement Mfg. Co. completed installation of a $500,000 fiberglass bag collection system for kiln dust at Cementon. The company planned to build a 235,000-ton-per-year kiln with a preheater. The $9 million expansion program, scheduled for completion by mid-1975, will increase the annual capacity of the Cementon plant by 45%.

Allentown Portland Cement Co., Division of National Gypsum Co. reactivated an old kiln at its Evansville plant.

Coplay Cement Mfg. Co., at Coplay, acquired a plant at Egypt, adjacent to the Coplay plant, from Giant Portland Cement Co. in early 1972 for $453,963, which had been idle since December 1969. The installation of a fiberglass baghouse was started, and two of the eight kilns were placed in operation by midyear. When completed by mid-1973, the annual capacity of Coplay-Egypt plant complex will be increased by 260,000 tons to a total of 1,350,000 tons. The company planned additio annual kiln capacity of 320,000 tons to installed in 1975 at the Coplay plant. I stallation of preheaters on kilns at t company's Nazareth plant increased outp capacity by 64,000 tons per year.

In October, the Lehigh Portland Ceme Co. announced an industrial, commerci and residential development program on 1,400-acre tract at the site of the firm former Fogelsville cement plant. Site pr aration and development work on t project, named Iron Run, was expected begin in 1973.

Cement production reached a reco level at the Bath, Pa., plant of Keysto Portland Cement Co. Net sales in 19 were $14.98 million, and net income w $1.16 million.

Production and shipments establish records for the third straight year at t Whitehall plant of Whitehall Ceme Mfg. Co. Net income in 1972 was 8.33 of sales and totaled $12.84 million.

Clays.—Including kaolin, the total p duction of all clays and shales was 12.9 greater in tonnage and 67.4% greater value compared with 1971 because of average increase in value per ton to $5. from $4.02 in 1971. Clays were produc in 27 counties by 48 companies. Producti and value data follow:

Type of clay	Producing counties	Production (thousand short tons)	Value (thousands)	Average value per ton
Common clay and shale	23	1,858	$5,406	$ 2.91
Fire clay	10	769	9,810	12.76
Kaolin	3	55	613	11.15
Total	XX	2,682	15,829	5.90

XX Not applicable.

Seven companies, each producing more than 100,000 tons, collectively produced 1,526,062 short tons, equaling 56.9% of the total production and 72.0% of its total value.

The Pennsylvania Geologic Survey in cooperation with the U.S. Geological Survey participated in a two-phase clay-shale program in the Greater Pittsburgh Region Area. Phase 1 consisted of a comprehensi compilation of existing lithologic, phy cal, mineralogical, and use data, on cla shale samples from Allegheny, Armstron Beaver, Butler, Washington, and Westmo land Counties. Phase 2 was concerned wi the collection and analysis of new data

lay-shale resources in the area. The Bureau of Mines and the Pennsylvania Geologic Survey under a cooperative agreement began laboratory tests to determine the properties and potential uses of samples from the six-county region.

The Bylite Corp., Wilkes-Barre, manufactured Lelite by bloating metamorphic, carbonaceous shale. The raw material came from the 13-million-ton Prospect bank, an accumulation resulting from nearby anthracite mining in the 1836–1936 period. The Prospect bank was the last remaining, large, uncontaminated shale bank in the Lehigh Valley. The separation of carbonaceous shale from anthracite by heavy media separation resulted in the recovery of about 5-weight-percent salable anthracite. The recovered carbonaceous shale was crushed to minus ¾-inch size before sintering on a 15-foot-wide, 50-foot-long grate. Oil-fueled burners were used to attain a 2,800° F ignition temperature during the first 5 feet of grate travel. About 450 tons per day of bloated shale was produced when using a 4-inch-thick bed and a 1-foot-per-minute grate-travel rate. Lelite, one of the oldest lightweight aggregates produced in the eastern United States, was marketed in four basic sizes.

The A.P. Green Refractories Co. permanently abandoned, on January 6, 1972, the Dimeling No. 1 clay strip mine in Lawrence Township, Lawrence County.

Table 22.—Pennsylvania: Clays sold or used by producers, by use, in 1972

Use	Short tons
Common brick	412,384
Face brick	1,024,822
Firebrick, block, and shapes	639,205
High-alumina refractories	37,269
Cakes, clutches, and linoleum	1,748
Lightweight aggregate	72,500
Mortar and cement, refractory	43,728
Portland and other cements	273,181
Sewer pipe	95,274
Terrain, quarry, and structural tile	33,292
Other [1]	29,828
Exports:	
Refractories	9,486
Brick and glazed tile	8,834
Total	2,681,551

[1] Includes animal feed, flue linings, paint, pesticides and related products, refractory grogs and crudes, rubber, and water treatment.

Pennsylvania manufacturers of refractories, plant locations, and products, according to Industrial Minerals,[15] are listed in table

Fluorspar.—Fluorspar briquetting and pelletizing plants were operated in 1972 by the Cometco Corp., Duquesne, and the Glen-Gerry Shale-Brick Corp., at Reading.

Gem Stones and Minerals.—A new Triassic copper occurrence of malachite and azurite on fractures in hornfels (a sediment altered by an igneous diabase) was reported near Rossville, York County. Channel samples representing ten feet of section contained: 0.6% copper; 0.01 ounce of gold per ton; 0.2 ounce of silver per ton.

Glass.—PPG at its new Mount Holly Springs plant in Cumberland County started operating one float glass line in April and a second line in July. When in full operation, the half-mile-long, 25-acre facility will have 850 employees and a $9 million annual payroll. The plant has a potential annual production of 300 million square feet of glass for use primarily by the transporation and construction industries.

Ponds were built at the plant for the air cooling of heated cooling water before disposal of a portion by seepage into the ground and discharging the remainder into a trout stream. PPG's operations in Pennsylvania included a float glass plant in Meadville; fabricating plants at Creighton, Ford City, Greensburg, and Tipton; a glass research center at Harmarsville; and satellite laboratories at Creighton and Ford City. PPG announced on September 14 the transfer of some insulating, reflective, and heat-strengthened glass making operations from Creighton to Ford City. The transfer was expected to be complete in January 1973 and result in the loss of about 50 jobs in the Creighton area. At the Tipton fabricating plant, a multi-million-dollar expansion program began, which will increase the plant's tempering capacity by 50%.

Employees of the Dearborn Glass Co. plant in Jermyn, Lackawanna County, were recalled April 20 to ready the plant for a return to full production following ratification April 19 of a 2-year contract with Allied Technical Workers of America and Canada. The 70-employee plant manufactured face plates for color television sets.

Graphite.—Compared with 1971, the total tonnage of shipments of synthetic powder, scrap, and other graphite products was 31.8% greater although the value of production increased only 15.5%. Three companies collectively produced anodes, elec-

[15] Industrial Minerals. Refractories in the USA. No. 62, November 1972, pp. 9–27.

Table 23.—Pennsylvania: Refractories manufacturers

Manufacturer	Plant location	Products
A. P. Green Refractories Co., subsidiary of United States Gypsum Co.	Climax	Firebrick.
Do	Philadelphia	High-alumina brick and monolithic
Do	Tarentum	Brick, basic.
BMI Inc	Carnegie	Monolithics, basic and nonbasic.
Bognar & Co	Pittsburgh	Do.
Butler Refractories Div., Spang & Co.	Butler	Monolithics, nonbasic.
C—E Refractories Div., Combustion Engineering, Inc.	Port Kennedy	Castables, high-alumina shapes, ki furniture, crucibles, mortars.
G. & W. H. Corson Inc	Plymouth Meeting	Bricks, monolithics, nonbasic.
Dolomite Brick Corp	York	Brick.
Drexel Refractories Inc., Drexel Dynamics Corp.	Kittanning	Brick, monolithics, nonbasic.
Foreco Inc	Mt. Braddock	Brick, shapes, nonbasic.
J. H. France Refractories Co	Snowshoe	Alumina-silica brick and mono- lithics.
Do	Windburne	Moldable refractories.
Freeport Brick Co	Freeport	Brick, shapes, nonbasic.
Garfield Refractories Co	Bolivar	Brick, monolithics, nonbasic.
General Refractories Co.,	Claysburg	Silica brick.
U.S. Refractories Div.,	Frankstown	Quartzite materials.
Do	Salina	Fireclay brick.
Do	Sproul	Monolithics, insulating brick.
Do	Clearfield	Fireclay and high-alumina brick a monolithics, structurals.
Harbison-Walker Refractories Div., Dresser Industries, Inc.	Mt. Union	Siliceous and silica refractories.
Do	Templeton	Fireclay brick.
Do	Johnstown	Shapes, nonbasic.
Haws Refractories Co	Grove City, New Castle	High-alumina crucibles, brick a kiln furniture.
Interpace Corp., Shenango Refractories subsidiary.	Zelienople	Insulating firebrick shapes and fibers; castables, gunning, mix and mortars.
Do	Pittsburgh	Crucibles, monolithics, basic a nonbasic.
Johns-Manville Corp	Philadelphia	Brick, monolithics.
Lava Crucible—Refractories Co	Pittsburgh	Shapes, monolithics, nonbasic.
Lavino Div., International Minerals & Chemical Corp.	Philadelphia	Crucibles, monolithics, nonbasic.
Mt. Savage Refractories Co	Curwensville	Fireclay brick, high-alumina bric castables, moldables, ramming mixes, mortars.
National Crucible Co	Mt. Union	Silica brick and mortars.
North American Refractories Div., Eltra Corp.	Womelsdorf	Refractories, brick.
Do	Vanport	Do.
Do	Norristown	Brick, shapes, monolithics, nonbasi
H. K. Porter Company, Inc	Philadelphia	Crucibles, shapes, basic and nonbasic.
Resco Products, Inc	Johnstown	Brick, shapes, nonbasic.
Ross-Tacony Crucible Co	Pittsburgh	Brick, monolithics, nonbasic.
Hiram Swank's Sons	----do	Crucibles, shapes, nonbasic.
Union Mining Co., Inc		
Vesuvius Crucible Co		

tric motor brushes, and machined shapes, unmachined shapes, shapes and plates for the aerospace industry, and powder and scrap for carbon raisers, for the steel industry, and for unspecified uses. The principal raw materials used for synthetic graphite production comprised petroleum coke, lamp black, pitch coke, black oil, hydrocarbon gases, and unspecified additives.

The Pure Carbon Co., Inc., St. Marys, announced the development of highly porous carbon plates and tubes for filtering corrosive liquids and gases where purity was critical. Most of the company's grad offered in the Purebon series of materia were easily moulded and could be cleane and reused after treatment with appr priate chemicals. Experimental grad ranged from 9- to 77-volume-percent por sity, and from 0.53- to 1.82-gram-per-cubi centimeter density, and had surface are ranging up to 600 square meters per gra

Gypsum.—United States Gypsum Co. ca cined gypsum at Philadelphia in Philade phia County. Output and value were a proximately 46% greater than in 1971.

Iodine.—Inorganic and organic iodine mpounds were produced from crude io- ne by the Foote Mineral Company, Ches- r County; Whitmoyer Laboratories, Inc., banon County; and West Agro-Chemical, c., Washington County. The iodine pro- ıcts comprised potassium iodide, lithium ıide brine, hydriodic acid, ethylene dia- ine dihydroiodide, and phenothiazine.

Lime.—Nine companies produced lime at plants in nine counties. Leading counties ere Centre, Lebanon, and Butler. Leading oducers were Bethlehem Mines Corp., arner Co., and Mercer Lime & Stone Co. utput increased 7% but was 6% below e 1969 record. Among the States, Penn- lvania ranked third in lime production. he lime was used for steel furnaces, water ırification, refractories, mason's lime, and her uses. The lime was consumed in ennsylvania, Maryland, Ohio, New Jersey, ıd other states. Total consumption of ne in Pennsylvania was 2,252,000 tons.

Compared with 1971, the average value r all lime increased from $17.05 to $17.88 r short ton, hydrated lime increased from 9.56 to $21.03, and quicklime increased om $16.47 to $17.12.

Construction started in February on two parate baghouses to control dust emis- ons from five rotary kilns in Bethlehem's ne plant at Annville. The baghouses will ntain fiberglass bags treated with silicone ıd graphite.

Recipients of the 1972 National Lime ssociation Certificate of Achievement in fety included the quarry and lime plant J. E. Baker Co., York, with over 100,000 an-hours without a disabling injury, and the underground mine and lime plant of National Gypsum Co., Bellefonte, with 270,000 man-hours without a disabling injury.

Mica.—Micalith Mining Co., Inc., at its Hokes mill near Gleville in York County produced ground scrap and flake mica. In national rank, Pennsylvania was seventh in quantity and eighth in value of mica production.

Mullite.—The Remmey Div., A.P. Green Refractory Co., in Philadelphia County produced high-temperature sintered synthetic mullite. Compared with 1971, production and value declined 6.9% less and 7.1% respectively.

Perlite.—Crude perlite was shipped into the State and expanded at seven plants operated by six companies in seven counties. Compared with 1971, the total sold or used was 31.4% greater in quantity and 32.9% more in value. The average value in 1972 was $55.96 per short ton compared with $55.33 in 1971.

Expanded perlite was sold or used chiefly for roof insulating board and other formed products, for plaster, and as horticultural aggregates. Minor uses were for masonry and cavity fill insulation, low-temperature insulation, and Ekoperl products.

Sand and Gravel.—Seventy-five companies used 80 stationary plants, 11 portable plants, and 14 dredges to produce sand and gravel at 89 operations in 37 counties. The approximate quantities in million tons transported from producing sites by various means were as follows: 12.6 by truck, 0.6 by railroad and 5.6 by waterway. Leading producing counties were Bucks, Erie, West-

Table 24.—Pennsylvania: Lime sold or used by producers, by use

(Thousand short tons and thousand dollars)

Use	1971		1972	
	Quantity	Value	Quantity	Value
sic oxygen furnaces	732	11,607	852	14,219
ıter purification	134	2,380	181	3,033
nstruction	125	2,429	129	2,908
ectric furnaces	96	1,449	79	1,328
wage treatment	71	1,254	72	1,206
riculture	20	341	71	1,313
id mine water neutralization	W	W	35	585
per and pulp	42	664	22	372
nning	10	179	6	114
ıer uses[1]	530	9,703	444	8,724
Total	1,760	[2] 30,008	1,891	33,802

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."

[1] Includes open-hearth furnaces, refractory dolomite, miscellaneous chemicals, other metallurgy, ecticides, explosives (1972), silica brick, wire drawing, food, ore concentration, petroleum refin-, paint, alkalies, chrome (1971), magnesite (1971), sand lime brick (1971), sugar refining (1971), l uses indicated by symbol W.

[2] Data do not add to total shown because of independent rounding.

moreland, Lycoming, and Wyoming, which accounted for 50.8% of the total quantity and 44.9% of the total value.

The quantity of sand and gravel produced was 4.6% less but its value was 1.8% greater than that in 1971. Average value increased from $1.84 in 1971 to $1.96 per ton. Sand production was 3.9% greater and its value was 6.0% greater because of an average increase in value from $1.97 to $2.01 per ton. Sand used for building and paving purposes increased 3.8% in tonnage and 5.0 cents per ton in value. Ground and underground sands for industrial uses classed as molding, fire and furnace, glass, grinding and polishing, blast, engine, oil (hydrafrac), filtration, enamel, fillers, foundry, pottery, and miscellaneous totaled 3,993,000 short tons at an average value of $2.07 per ton, compared with 3,211,000 short tons, at $2.41 per ton in 1971. Gravel production decreased 14.8% in tonnage although its value was only 4.1% less than in 1971 because of an average 21-cents-per-ton increase. All except 6.1% of the total gravel production was used for construction purposes. Gravel accounted for 40.9% of the tonnage and 39.4% of the value of all sand and gravel production.

DER, in a major policy change in late February, banned dredging in untouched portions of the upper Allegheny River and elsewhere. Effective at the same time were restrictions applicable to existing dredging sites that banned dredging at night or during weekends, that prohibited the removal of sand and gravel from areas within 50 feet of the low-water mark onshore, that required boundaries to be clearly defined and marked, and that required that dredging must be gradually sloped. The area most affected by the new regulations was a 100-mile section of the Allegheny River between Freeport and Warren where there were six private dredging operations. Operators of each dredge paid $30 for a State permit and paid to the Fish Commission 10 cents for each ton of sand and gravel produced.

The Dravo Corp. in September announced plans for a $3.3 million sand and gravel plant at Georgetown. The plant will process materials from a 125-acre land deposit and from dredging in the Ohio River. Initial annual capacity will be 960,000 tons to be later expanded to 1.5 million tons. Construction will begin in the spring of 1973 and the plant should be operable in early 1974.

The Royer Foundry & Machine Co. demonstrated a new sand recycling system for air-set and no-bake foundry sands. Reclamation of these special chemical bonded sands was expected to save foundry operators thousands of dollars annually. Additionally, the patented equipment will reduce air pollution because the totally enclosed system uses dust collectors.

Table 25.—Pennsylvania: Sand and gravel sold or used by producers, by class of operation and use

(Thousand short tons and thousand dollars)

Class of operation and use	1971		1972	
	Quantity	Value	Quantity	Value
Commercial operations:				
Sand:				
Building	4,651	8,352	5,164	9,265
Fill	135	250	100	129
Paving	2,678	4,700	2,441	4,649
Other uses [1]	3,211	7,727	3,384	8,247
Total [2]	10,675	21,029	11,090	22,291
Gravel:				
Building	4,330	6,874	3,992	7,389
Fill	768	1,001	340	301
Paving	2,994	6,141	2,866	5,940
Miscellaneous	W	W	363	747
Other uses [3]	902	1,118	106	137
Total [2]	8,994	15,134	7,667	14,513
Total sand and gravel [2]	19,668	36,162	18,757	36,804

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Includes blast, engine, filtration, fire and furnace, glass, grinding and polishing, molding, oil (hydrafrac), ground, railroad ballast (1972), and other sands.
[2] Data may not add to totals shown because of independent rounding.
[3] Includes miscellaneous (1972) and other gravel.

Silica and Quartz (Manufactured).—Glasrock Products, Inc., Washington, produced fused silica in grain and fabricated forms.

The P. R. Hoffman Co., Carlisle, produced manufactured (synthetic) quartz crystals for its own use and for sale to other quartz crystal cutters. Pennsylvania was one of the major producers of finished synthetic quartz crystals for the electronic industry.

Slag.—In the 1971 National Slag Association safety contest for slag processing plants the Midland plant of the International Mill Service, Philadelphia, won a Class A-plaque because it had 158,400 man-hours without a disabling injury. Plants with a continuous no-lost-time accident record for five or more years were Bethlehem's slag plant (5 years, and the Johnstown plant of the Standard Slag Co. (9 years).

The Warner Co. of Philadelphia was installing a $500,000 dust control system at its blast furnace slag plant in Tullytown. Two bag-type collectors were to be installed in the blacktop plants and two in the Calumite operation where finely ground slag was prepared for use by the glass industry.

The Clairton slag plant in the late 1972 was installing and testing a baghouse collector before the plant resumed operation in the spring of 1973.

Stone.—Pennsylvania was the country's leading stone producer. Adams, Berks, Bucks, Chester, Lancaster, Montgomery, Northampton, and York Counties each produced more than 3 million short tons. Collectively, these eight counties accounted for 54.3% of the total quantity and 55.2% of the total value. The total output of the 18 producing counties was 4.4% greater and its total value was 5.0% greater than in 1971. The average value in 1972 was $1.85 per short ton, up 1 cent per ton compared to 1971.

Dimension stone produced at 32 quarries in 11 counties accounted for 0.13% of the total tonnage and 3.78% of the total value of all stone produced. The average value of all dimension stone increased to $51.60 per short ton from $49.20 in 1971. The type of dimension stone and the number of producing quarries were as follows: sandtone, 18; slate, 8, other stone 3, traprock, 2, and quartzite, 1. Dimension quartzite, sandstone, traprock (basalt), and other stone were used primarily for irregular shapes and sawed stone. Slate was primarily used for blackboard and flagging. Slate accounted for 37.4% of the total production of dimension stone and 77.2% of its total value.

Crushed and broken stone produced at 216 quarries in 47 counties accounted for 99.87% of the total stone production and 96.22% of its total value. No crushed and broken stone was produced in Potter County although some dimension stone was produced. The average value of crushed and broken stone produced was $1.78 per short ton, up 2 cents per ton from 1971.

The number of operations producing crushed and broken stone was as follows: limestone, 160; sandstone, 26; traprock, 16; quarzite, 8; dolomite, 4; granite, 2; and other rock, 2. The major uses for crushed and broken granite, limestone, quartzite, sandstone, traprock, and other stone was for road aggregates and road base stone. The major use of dolomite was for the preparation of calcined products.

Crushed and broken limestone accounted for 81.0% of the tonnage and 78.5% of the total value of crushed and broken stone. The percentage distribution by use of the crushed and broken limestone was as follows: road aggregates and road base stone, 63.9; cement manufacture, 16.5; flux stone, 5.1; lime manufacture, 4.1; agricultural uses, 1.6; and 15 minor uses, 8.8.

Six companies in five counties prepared limestone suitable for mine dusting. The 1972 output had an average value of $4.94 per short ton and totaled 149,130 short tons, 37.6% less than the 238,955-short-ton production in 1971.

Crushed and broken stone was transported as follows in percent: truck, 82.7; railroads, 10.2; waterways, 0.5; and other methods, 6.6.

Although some stone quarries and sand and gravel pits were inconvenienced by Agnes flood waters, an estimate of damages was not available.

The GAF Corp. discontinued operations at its Delta quarry in York County where the firm for many years had crushed quarried slate to produce roofing granules.

Kerris & Helfrick, Inc., Mt. Carmel, opened the first new stone quarry in northeastern Pennsylvania in the past 30 years on a 300-acre site near Elysburg, Northumberland County. The new quarry, known as the Bear Gap Stone Co., supplied several grades of crushed sandstone for use as road base material and in ready-mix concrete for markets in the Mt. Carmel-Shamokin area. One of the quarry's products was used

to provide skid resistance in an experimental road-surfacing project by the Penn DOT.

In July, the General Crushed Stone Co. doubled the capacity of its crushed stone plant at the Rock Hill quarry south of Quakerstown, Bucks County. The company completed an automated bituminous concrete plant April 15.

The Lancaster Lime & Stone Corp. announced plans in February to operate a quarry on a 307-acre tract near Lancaster. The permit for the quarry prohibited operations during evening hours, on Sundays, and during nearby funeral services.

The New Enterprise Stone & Lime Co., Inc., purchased the stock of Valley Quarries, Inc., Chambersburg. Facilities acquired included one quarry each near Chambersburg and Shippensburg; four ready-mix concrete plants in Chambersburg, Greencastle, Shippensburg, and Waynesboro; and two sand plants near Fayetteville.

The ninth National Limestone Institute (NLI) Safety Competition conducted by the Bureau of Mines and the NLI listed the following limestone quarries as having operated throughout 1971 without a disablin injury: Plymouth Meeting Quarry, G. W. H. Corson, Inc., Plymouth Meeting 129,296 man-hours; York mine, York Ston & Supply Co., York, 72,072 man-hours; Orm rod Quarry, Lehigh Stone Co., Ormrod 26,250 man-hours; Herndon mine, Mechley Limestone Products, Herndon, 10,725 man hours; and the Sugar Hill Quarry, Suga Hill Limestone Co., Brockaway, 6,225 man hours.

The National Cooperative Highway Research Program (NCHRP), administered b the Highway Research Board, awarded $50,000 contract to Valley Forge Labora tories Inc., Devon, Pa. The research agenc in 15 months will inventory types, sources and quantities of industrial, domestic, an mining waste materials potentially suitabl for producing synthetic aggregates or othe wise replacing the needs for conventiona aggregates in highway construction.

The American Marietta Corp. operate aggregate plants at Coolspring, Lake Lynne Malvern, Pleasant Gap, and Williamson.

Table 26.—Pennsylvania: Stone sold or used by producers, by use

(Thousand short tons and thousand dollars)

Use	1971		1972	
	Quantity	Value	Quantity	Value
Dimension stone:				
Building stone	55	960	49	83
Curbing and flagging	24	637	21	54
Other uses [1]	29	3,718	22	3,31
Total [2]	108	5,314	91	4,69
Crushed and broken stone:				
Bituminous aggregate	6,048	11,019	6,125	10,86
Concrete aggregate	9,600	15,202	8,740	13,99
Dense graded roadbase stone	10,009	16,943	15,346	25,34
Macadam aggregate	1,340	2,254	2,018	3,96
Surface treatment aggregate	2,681	3,779	3,321	5,24
Unspecified construction aggregate and roadstone	12,689	20,985	7,404	13,02
Agricultural limestone	1,620	4,392	1,064	3,45
Cement manufacture	W	W	11,106	14,67
Fill	--	--	118	9
Filter stone [3]	271	500	W	W
Flux stone [4]	4,100	8,095	3,405	7,27
Glass	W	W	115	43
Lime manufacture	W	W	2,752	5,36
Mineral fillers, extenders, and whiting	--	--	508	2,66
Railroad ballast	619	1,036	1,500	2,56
Refractory stone	199	2,498	179	1,31
Riprap and jetty stone	187	327	676	1,39
Special uses and products [5]	W	W	154	76
Stone sand	W	W	444	1,05
Other uses [6]	14,996	26,125	2,240	6,14
Total [2]	64,359	113,155	67,216	119,64
Grand total	64,467	118,469	67,307	124,34

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Includes monumental, roofing slate, millstock, and uses not specified.
[2] Data may not add to totals shown because of independent rounding.
[3] Includes stone sand (1971).
[4] Includes stone used in dead-burned dolomite (1971).
[5] Includes mine dusting and abrasives.
[6] Includes stone used in chemical stone (1971), roofing aggregates, dead-burned dolomite (1972) poultry grit, acid neutralization, building products (1972), disinfectant (1971), lightweight aggregate (1971), paper manufacture (1971), other soil conditioners (1971), and other uses not specified

Table 27.—Pennsylvania: Stone sold or used by producers, by county
(Thousand short tons and thousand dollars)

County	1971			1972			Kind of stone produced in 1972
	Number of quarries	Quantity	Value	Number of quarries	Quantity	Value	
rmstrong	5	249	525	4	173	397	Limestone.
erks	11	4,018	5,475	12	4,649	6,377	Limestone, sandstone, traprock.
lair	9	1,318	2,223	8	1,213	2,164	Limestone, dolomite, quartzite.
ucks	14	5,030	9,257	20	4,929	7,631	Sandstone, traprock, limestone, granite, other stone.
utler	5	1,623	3,679	7	1,592	3,894	Sandstone, limestone.
arbon	--	W	W	3	101	W	Limestone, sandstone, quartzite.
entre	8	2,710	4,810	9	2,537	4,245	Limestone.
hester	7	2,085	2,963	7	3,536	5,903	Sandstone, limestone, traprock.
larion	3	206	W	3	220	W	Limestone.
umberland	6	W	3,258	6	1,758	2,998	Do.
auphin	3	W	1,311	4	1,659	2,667	Limestone, sandstone.
luntington	6	673	2,347	5	667	1,236	Limestone, quartzite.
uniata	--	--	--	1	242	366	Limestone.
ancaster	15	4,968	9,177	17	4,350	7,974	Limestone, dolomite.
awrence	4	2,387	3,465	4	2,095	3,470	Limestone.
ehigh	7	1,756	3,149	9	2,215	3,450	Slate, limestone.
uzerne	3	1,134	1,741	4	669	1,072	Sandstone.
IcKean	1	39	W	1	W	W	Do.
lontgomery	14	5,574	10,050	15	5,182	9,592	Sandstone, traprock, other stone.
orthhampton	20	6,433	11,538	17	6,020	11,388	Slate, limestone, quartzite.
orthumberland	3	235	520	2	W	W	Sandstone.
otter	3	3	101	3	1	29	Limestone, sandstone, quartzite.
chuylkill	3	162	W	3	W	670	Sandstone.
omerset	4	457	1,225	4	874	2,101	Limestone, sandstone.
usquehanna	7	W	553	7	W	661	Sandstone.
Vestmoreland	8	1,692	3,378	10	1,758	3,657	Sandstone, limestone.
ork	10	3,488	7,988	10	4,410	9,537	Limestone, dolomite, sandstone.
Indistributed [1]	r 54	18,228	29,736	52	16,454	32,861	Do.
Total [2]	233	64,467	118,469	247	67,307	124,340	

r Revised. W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Includes production for Allegheny (1971), Adams, Bedford, Cambria, Clinton (1972), Columbia, Delaware, Elk, Fayette, Franklin, Fulton, Jefferson, Lebanon, Lycoming, Mercer, Mifflin, Monroe, Montour, Perry, Snyder, Union, Washington, and Wayne Counties.
[2] Data may not add to totals shown because of independent rounding.

Sulfur.—Four petroleum refineries operated by four companies in Delaware and Philadelphia Counties used modified or improved Claus processes to produce 21,999 long tons of elemental sulfur (100%-basis). Shipments totaling 22,170 long tons (100%-basis) were 5.6% greater than in 1971 and averaged $24.00 per long ton ($3.14 per long ton greater than in 1971), and the total value of shipments was 21.5% greater. Stocks decreased 171 long tons during 1972. One refinery in Philadelphia County used monoethanolamine in a Girdler system to recover hydrogen sulfide. Compared with 1971, production was 13.6% less, and shipments were 12.5% less in quantity and 16.0% less in value.

Compared with 1971, the total production of sulfuric acid on a 100% basis was 2.5% less and its value was 10% greater.

Talc.—Conestoga Minerals, Inc., announced discovery of the Talanco talc deposit in Fulton Township, southern Lancaster County. A drilling program indicated sufficient reserves to justify mining. Plans to develop the deposit were under study.

For the second consecutive year, no talc was produced by Summit Industries Inc.,

the State's former sole talc producer, in Adams County.

Tripoli (Rottenstone).—Crude tripoli was produced at two mines in Lycoming County. Compared with 1971, production was 2% greater and its value was 75% greater. The prepared material was sold or used as abrasives and fillers.

Vermiculite (Exfoliated). — Vermiculite shipped into the State was exfoliated by Hyzer & Lewellen, at Southampton; by the Construction Products Division, W. R. Grace & Co. at Ellwood City; and by the Vermiculite Industrial Corp. at Pittsburgh. Compared with 1971, the total quantity produced was 22% greater, the total quantity sold or used was 15.4% greater, and the total value of vermiculite sold or used was 9.2% greater. Uses in order of decreasing tonnage were loose fill aggregate, horticulture, and concrete aggregates. Plaster aggregates, pool base, roofing aggregates, and miscellaneous uses accounted for about 3% of the quantity sold or used.

METALS

Aluminum.—Ground was broken in early April for the fourth stage of the Aluminum Co. of America (Alcoa) Technical Center on a 2,300-acre site at Merwin, Westmoreland County. When completed in 1974, the addition will have 275 employees engaged in engineering research, and engineering, computer, purchasing, accounting, personnel, equipment manufacturing, and maintenance services. The Center developed the technology for a new aluminum process that decreases electricity consumption up to 30% and dispenses with the need for cryolite for processing raw alumina. Instead, alumina is reacted with chlorine to form aluminum chloride that is decomposed electrolytically to aluminum, and chlorine that is recycled. The process was developed during a 15-year, $25 million project.

Alcoa developed a new process to produce alumina fibers for use as insulation on space vehicles and for high-temperature industrial processes. The new material will cost $5 per pound or less, compared with several hundred dollars per pound for other alumina fibers available in 1972. The fibers can be used at sustained temperatures above 3,300°F, compared with 2,600°F for a currently produced high-heat-resistant insulation, which comprises 50% alumina and 50% glass fiber. Samples of the new fibers, which contain 99% polycrystalline alpha alumina, will be available about mid-19

Beryllium.—The Kawecki Berylco Industries, Inc. (KBI) plant at Hazleton was the site of job safety discussions between KBI officials and representatives of the Oil, Chemical and Atomic Workers International Union (OCAW) that could set a precedent for the chemical industry. According to a KBI official, the firm spent $300,000 in the past 2 years to improve the working environment in the plant. KBI announced that its new continuous-cast beryllium-copper rod was replacing wrought and hot-worked beryllium-copper rod for plunger tips in the die casting industry. The routine long tip life between sizings was obtained when using the new material. KBI started production in September of an improved beryllium-copper casting alloy called Berylco 21C. The alloy attracted attention in the automotive field, particularly for large, thin-walled castings where good reproduction and a polished surface are required.

National Beryllia Corp.'s Sealox Division plant in Plumsteadville, Bucks County, attained full production in August. The 40,000-square-foot, 100-employee plant produced beryllium oxide ceramics for use in aerospace, nuclear, and undersea programs.

Carbide Metals.—Kennametal, Inc., Latrobe, produced cemented carbide tools and other related products. Particularly good gains in sales of mining and construction tools were noted. Hydro Carbide Corp., a subsidiary of Vulcan, Inc., started a new 30,000-square-foot, $1 million plant in Latrobe to produce specialty carbide metals. The new plant will triple Hydro production capacity and also increase the size range of sintered tungsten carbide shapes.

Cobalt.—The permanent closure of Bethlehem's Cornwall iron ore mine, because of flooding in late June by Agnes terminated the only domestic sources of cobalt. An official of Pyrites Co., Inc., Wilmington, Del., stated that the company received a small volume of cobalt-containing solution during January and February from Bethlehem's pyrite roasting and leaching operation at Sparrows Point, Md., that was phased out before yearend 1971. As a result, no production of cobalt was credited to Pennsylvania in 1972.

Copper.—The State's production of copper was 22.1% less than in 1971 becau

f the permanent closing of Bethlehem's ornwall iron ore mine. The average value as 51.2 cents per pound, compared with 2.0 cents per pound in 1971.

Erie Electric Manufacturing Corp. started rolling mill in Erie to produce unusual hapes of copper and other nonferrous etals. Although most of the plant's pro-ucts were made from high-conductivity ake copper, the new mill could also form luminum, brass, and bronze into grooved, edge, or special shapes with a minimum f tooling cost.

Iron Ore.—As a result of flooding caused y tropical storm Agnes on June 22, both he No. 3 and No. 4 mines at Bethlehem's ornwall operation were permanently closed fter 230 years of iron ore mining. After ewatering, the Cornwall open pit con-nued operating for the remainder of 1972 lthough the ore was expected to be de-leted in March 1973. Bethlehem's Grace perations resumed production at the end July following a 4-week vacation shut-own. The Grace Mines' mobile mining stem, which attained full operation dur-ig 1970, included 8-ton-capacity, diesel-owered, load-haul-dump vehicles, a 2,500-ot-long conveyor belt, an ore crusher, nd a complete equipment repair shop 200 feet underground. All main headings r the block-caving method used in the race mine were drilled by two, three-boom niversal jumbos. The conveyor belt dis-harged into a hoist-loading pocket. At ornwall, production and shipments of iron e pellets were 39.3% less than in 1971; halcopyrite production was 24.3% less but hipments were 30.5% greater. No pyrites as produced or shipped from the Cornwall peration. Compared with 1971, the Grace peration produced and shipped 6.2% ore iron ore pellets. No pyrites was pro-uced or shipped, and none of the chal-pyrite production was shipped. Total nsumption of explosives at the Cornwall ine comprised 274,975 pounds of dyna-ite, 291,775 pounds of AN-FO, and 358,-0 pounds of Flo-gel, a mixture of AN-FO d dynamite. At the Grace mine 660,200 unds of dynamite and 119,250 pounds of N-FO were consumed.

The tonnage of all iron ore pellets ipped from both operations was 13.1% s and their value was 11.6% less than 1971.

Iron Oxide Pigments.—Finished natural d manufactured iron oxide pigments were shipped by three companies. Shipments were 12.5% greater and their value was 17.9% greater than those of 1971.

Iron and Steel.—According to the American Iron and Steel Institute, the State's raw steel production was 30,416,000 short tons compared with 27,665,000 short tons in 1971 and 30,031,000 short tons in 1970. Total blast furnace production of pig and silvery irons and ferroalloys totaled 20,840,-000 short tons, 10.9% more than in 1971. Blast furnace production of ferroalloys accounted for 483,000 short tons of the total tonnage compared with 362,000 short tons in 1971 and 395,000 short tons in 1970.

Active blast furnaces numbered 26 on January 1 and 32 at yearend. Idle blast furnaces totaled 29 on January 1 and 23 at yearend. Solids charged into blast furnaces comprised 8,399,193 short tons of iron ores, 3,609,932 tons of regular sinter, 7,580,-179 tons of regular iron ore pellets, 2,105,870 tons of agglomerates from foreign countries, 546,323 tons of limestone, 197,559 tons of burnt lime, 1,531,119 tons of dolomite, 132,848 tons of other fluxes, 350,610 tons of mill cinder and roll scale, 880,460 tons of steel furnace slags, 77,640 tons of raw flue dust, 12,754,701 tons of breeze-free coke, 83,929 tons of coke breeze, 11,724 tons of pig iron, 789,881 tons of home and purchased scrap, 111,583 tons of slag scrap, and 313 tons of alloys and miscellaneous solids. Blast furnaces produced 151,867 tons of scrap containing 112,078 tons of iron, 5,644,667 tons of slag, and 482,242 tons of recovered flue dust containing 173,125 tons of iron. The average blast furnace consumption of coke per short ton of hot metal was 1,224 pounds, 2 pounds greater than the national average. Supplemental fuels injected into blast furnaces through tuyeres comprised 3,174 million cubic feet of natural gas, 145 million cubic feet of coke oven gas, 21,952,172 gallons of bunker C oil, 30,037,207 gallons of No. 6 oil, 3,897,327 gallons of crude coal tar, and 4,332 short tons of stove coal.

Open hearth, BOF, and Bessemer steel furnaces consumed 525,641 tons of iron ores, 57 tons of regular sinter, 58,626 tons of regular iron ore pellets, 33,306 tons of agglomerates from foreign countries, 455,787 tons of limestone, 670,728 tons of burnt lime, 537,260 tons of dolomite, 85,788 tons of fluorspar, 308,324 tons of other fluxes, 12,162 tons of mill cinder and roll scale, 279 tons of anthracite, 18,447,545 tons of pig

iron and hot metal, 11,205,023 tons of home and purchased scrap, 100,590 tons of slag-scrap, and 90,594 tons of other scrap.

Agglomerating plants consumed 11,628,757 tons of ores, 1,473,305 tons of limestone, 1,233,968 tons of dolomite, 98,711 tons of unspecified fluxes, 938,225 tons of mill cinder and roll scale, 638,120 tons of raw flue dust, 465,898 tons of steel furnace slag, 717,135 tons of coke breeze, and 230,556 tons of Pennsylvania anthracite. Agglomerating plants produced 2,819,221 tons of regular sinter and 10,443,692 tons of semi- and self-fluxing sinter.

Stocks of pig iron at furnaces totaled 179,912 tons at the start of 1972 and 161,130 tons at yearend. Pig iron and hot metal shipped for sale, transfered for interplant consumption and withdrawn from stock during 1972 totaled 20,374,283 tons and averaged $79.97 per ton in value. Stocks of agglomerates on January 1 totaled 313,549 short tons and 336,942 short tons on December 31. Stocks of iron ores declined from 10,875,547 tons on January 1 to 9,132,528 tons at yearend.

Alan Wood Steel Co., Conshohocken, during the year attained effective control of all current water pollution problems and reduced emission of coke oven air pollutants for which full control was not expected awaiting a DER consent decree on equipment modifications in the coke and chemical departments to reduce contaminant emissions. By yearend the Conshohocken plant's overall emissions were reduced to 3.7 tons per day—a 94% reduction from the 60-tons-per-day-base total emissions. The company expected to spend more than $6 per ton of annual raw steel capacity between 1971 and 1975, not including an undefined, continual, additional operating expense. The company received a $352,000 grant from EPA toward the cost of a $1.8 million demonstration water purification plant. Equipment added in 1972 included a scrubber and baghouse for removal of dust emitted at the sinter plant, a hot blast stove replacement, a blast furnace gas bleeder, and a 125,000-pound-per-hour package boiler. The Conshohocken plant, one of two in Pennsylvania, regularly used gas-oxygen and oil-oxygen lances as an auxiliary fuel, to preheat scrap charged into basic oxygen converters when the hot metal's silicon content was low.

The Beaver Falls plant of the Babcock & Wilcox Tubular Products Division during October started operation of five baghous built at a cost of $11 million. The ba houses were designed to handle a total 2.36 million cubic feet per minute of gas emitted by electric-arc furnaces in tl Kippel and Wallace Run steelmaking shop The system, comprised of 10,296 Dacr filter bags, each 31 feet long and about foot in diameter, eleven 900-hp fans, ar 12- and 14-foot-diameter ducts, will move about 55 tons of particulates fro the gases handled per day. In June, tl firm awarded Ferro-Tech Industries, Inc., contract for a turn-key project to desig and install a system to handle 30 tons p day of particulates, and convert them in dustless micropellets. In September, Ba cock & Wilcox started a $3.2 million expa sion program, financed through loans b the Pennsylvania Industrial Developme Authority (PIDA) and the Regional I dustrial Development Corp. of Southweste Pennsylvania. The expansion of the No. melt shop at Wallace Run will inclu equipment for the argon-oxygen-decarbu zation of steel (AOD process) and for ES refining. The AOD shop will have a 2 ton reactor in which argon and oxygen a blown through molten steel.

Allegheny Ludlum Steel Corp., a divisio of Allegheny Ludlum Industries, Inc., ded cated a $2.5 million plant in June to handl waste water in Harrison Township, All gheny County, and started a $1.8 millio plant in Brackenridge to process picklin rinse water and scrubber effluent. Plan were announced in December to spen $2,225,000 to build and install additiona air and water pollution control systems i 1973 at its plants at Brackenridge an Natrona. This money was obtained follow ing approval of a loan guarantee by th Allegheny County IDA.

The firm planned to spend $10 million i 1972 on a major expansion of its silico electrical steel facilities and another $ million in 1973 at its Bagdad Plant in Wes Leechburg. Automatic gage control equip ment for a cold strip reversing mill wa installed at the Bagdad plant. Installation were completed at the Brackenridge plan of a normalizing furnace, a 44- by 220-incl semiautomatic roll grinder, and equipmen to treat hot strip mill water.

Floods caused by tropical storm Agne closed the Bethlehem Steel Corp.'s (Bethle hem) Steelton Plant, damaged the rollin

ill at Johnstown, and idled a structural eel fabricating plant at Pottstown.

Bethlehem and the DER signed a consent order that provided for the elimination f air pollution at the Bethlehem and ohnstown byproduct coke oven operations. The agreement prevented DER from prosecuting Bethlehem during the 5-year period rovided in the order. However, Bethlehem as expected to take immediate steps to educe emissions and to outline its long-ange plans for specific procedures and quipment by December 31, 1972. The 5-ear deadline called for coke ovens to re-ease no visible emissions, other than ater mist or vapor, in excess of No. 1 ingelman or 20% opacity—a standard considered by Bethlehem's manager of environmental quality control as lacking in objective precision because of the uncertain vailability of technology. Compliance with he consent order will cost Bethlehem $22.5 illion or more. On August 29, the Northampton County IDA offered $30 million tax-exempt bonds to cover the costs of r and pollution control equipment in ethlehem's plants as follows: Bethlehem lant—air quality controls for a new coke en battery, $5.6 million; desulfurization all coke oven gas, $5.4 million; and air id water quality controls for specialty eel units, $1.5 million. Steelton plant—ectric furnace fume collection system, 5.0 million. Lebanon plant—collection and circulation of mill waste waters, $2.6 illion. Johnstown plant—desulfurization coke oven gas, $5.5 million; ferromanganese blast furnace cast house fume collection system, $2.6 million, ferromanganese pig machine fume collection system, .3 million.

In J & L's Aliquippa Work, break in ials were completed in November on a et scrubber and a 761,000-square-foot collector-area electrostatic precipitator complex the BOF steelmaking shop. The complex, signed to remove particulates from 1.65 illion cubic feet per minute of BOF exust gases, was expected to collect 250 ns per day of solids. The installation will ow J & L to operate simultaneously two the shop's three furnaces without violan of clean air standards, and will make possible for the Aliquippa Works to ost steel production by 5% or 200,000 ns per year.

Construction of air and water pollution ntrol equipment at the Aliquippa Works was financed by the issue of $17.5 million in tax-free bonds in May by the Beaver County IDA. J & L during December completed the first phase of a $7 million program to rebuild the Aliquippa coke ovens and to reduce air pollution problems. Fifty-three ovens were restored to full production and were ready for the installation of equipment to curb emissions during the coal charging and coke pushing operations after the necessary technology is developed and proved.

In midyear, a $10 million project was started at Aliquippa to expand and modernize facilities for heating ingots to rolling temperature. The project, scheduled for completion in 1973, included a new larger building to house the older ingot soaking pits, a new battery of soaking pits, a new railroad track system, and three new overhead cranes. Open hearth furnaces phased out of operation several years earlier were demolished to make space for the new building.

J & L and ACHD agreed on a compliance order calling for desulfurization of coke oven gas at the Pittsburgh Works. The firm filed a third petition with ACHD for a control waiver ending March 1, 1974, to allow negotiations to continue for the purchase of 0.8% sulfur coal for the Southside steam-and-electric system of the Pittsburgh Works.

The Pittsburgh Works of J & L on January 21 tapped the first heat from an open hearth furnace since September 8, 1971. Two blast furnaces started production January 17, and three additional open hearth furnaces resumed operation January 25. About 2,000 workers were recalled to man these operations. The works continued to produce hot and cold finished bars although the production of billets, which are rolled into bars, was transferred to the Aliquippa Works where the faster and more flexible 200-ton BOF furnaces permitted a closer control on inventory than the 350-ton open hearth furnaces at the Pittsburgh Works. The continuous-casting unit at Aliquippa eliminated the time-consuming and costly ingot pouring, reheating, and primary rolling operations. The shift of operations allowed J & L to retire an old, inefficient 28-inch billet mill and a 44-inch blooming mill in the Pittsburgh Works. Six of the 11 open hearth furnaces in the Pittsburgh Works were equipped with roof burners that permitted the charging of 70% scrap and 30% molten iron. The use of roof burners and

oxygen lancing reduced the refining time of open hearth steel from the normal 9 hours to 6 hours. Five open hearth furnaces and other facilities were shut down to permit the Pittsburgh Works to meet cost objectives.

Representatives of J & L and DER continued negotiations in September relating to the spillage of acidic mine water July 29 into Dunkard Creek when a retaining dam was damaged near J & L's Shannopin coal mine.

J & L's shipments of products from its Pennsylvania and Ohio operations totaled 5.1 million tons compared with 4.9 million tons in 1971. Records were set in steel production at the Aliquippa Works, and significant increases in productivity were attained in the primary operations of the Pittsburgh Works.

The Lukens Steels Co., Coatesville, produced high-purity steel plates and slabs in a new ESR facility. The Coatesville plant could produce slabs weighing up to 50,000 pounds and measuring 30 inches thick and 60 inches wide. Plates could be rolled up to 12 inches thick in weights up to 36,000 pounds. New equipment installed during the year included the ESR facility, a graphite storage and injection system for two electric furnaces, an additional 135-ton ladle, an enlarged car-bottom, heat-treating furnace, a plate demagnetizer, a hot top cutting machine scarfer, radio controls on nine overhead traveling cranes, and air pollution abatement equipment for two 100-ton, electric-arc furnaces. A $18.75 million melt shop expansion program was started during 1972 to include a fourth 150-ton electric-arc furnace slated for initial production in late 1973. This furnace will enable the phasing out of the remaining open hearth furnaces with minimal loss of production capacity. Included in the expansion program will be a $3.12 million expenditure for air and water purification equipment.

Luken's Coatesville plant in the first half of 1972 used about 6,300 gross tons of prereduced Midrex iron pellets equal to 12% to 22% of the materials charged into a 150-ton electric-arc furnace. The pellets were made by the Georgetown Steel Corp., Georgetown, S.C. and were hauled by barge from Georgetown, S.C., to Wilmington, Del., and then were moved by truck to Coatesville, Pa.

The Sharon Steel Corp., at its Roemer Works in Sharon, resumed production July 3 after 2,000 workers returned to work following a 2-day strike over safety issues. In September a $3.75 million Venturi scrubber system for use with the Kaldo BOF shop was formally dedicated at the Roemer Works. The corporation announced plans in June to install a conventional oxygen steel refining vessel with provision made to convert the vessel at a later date to a bottom-blown Q–BOP design. Sharon is 85.6% owned by the NVF Company, who also owns the Pennsylvania Engineering Corp., a builder of Q–BOP vessels. Sharon also made steel in two rotating Kaldo converters and several electric-arc furnaces, all of which had a combined capacity of only about 100,000 tons per month. Sharon announced in August that it would move the pipe and tube mill operated by its subsidiary, the Union Steel Corp., from Piscataway, N.J., to Greenville, Pa., adjacent to Sharon's Damascus Tube Division facilities, 11 miles from Sharon's plant in Farrell.

Sharon installed an AirPol Venturi scrubber and gas cooling tower for cleaning blast furnace gas at Farrell. The scrubber was designed specifically to operate with the modulating control of a blast furnace's top pressure. Other expenditures were made at Farrell for 60-inch hot-mill improvements, pickling line improvements, and a coating thickness gage on a galvanizing line.

After 9 months of court-supervised negotiations, attorneys of United States Steel Corp., DER and the Allegheny County Commissioners, in late October, signed the last two sections of a consent decree for correcting environmental problems at the Clairton Coke Works. The reduction of sulfurous emissions will be implemented by desulfurizing coke oven gas used to heat the coke ovens by February 1975, and the desulfurization of coke oven gas used for other fuel purposes by February 1977. It was also agreed that the firm will use low-sulfur-content coal in its steam generators in Allegheny County. The 87-oven No. 21 coke oven battery at Clairton was rebuilt and provided with newly designed doors and jambs 3 months ahead of schedule at a cost of $6 million, and rebuilding of the 87-oven No. 2 battery was started. Other projects in progress to reduce emissions included an oven-door-rebuilding program, the use of "electric-eye" equipment-

potting devices, the use of steam aspiration during the charging of coal into coke ovens, the use of a 4-year-old cryogenic system to remove up to 100 tons per day of hydrogen sulfide from coke oven gas, and a special training program for coke oven personnel.

Also signed in late October was the Quench Water Agreement that provided for more than 99% reduction in phenolics and 95% reduction of ammonia and other chemicals in waste waters discharged from the Clairton Coke Works. The agreement will terminate the quenching of coke using contaminated water by July 1975. Within a 3-year period a plant will be built to biologically treat and to remove ammonia from waste waters. In the same time period pilot plants will test methods to reduce the content of phenolics, cyanides, and thiocyanates in waste waters. The most effective system will be used in the full-scale treatment plant. The construction and operation of the pilot plants will be supervised by ACHD and DER personnel. Reportedly, it will cost $25 million to comply with the environmental standards covered by the two agreements and another $1 million for pilot plant research to determine the feasibility of further pollution controls.

DER filed suit November 22 against United States Steel for civil penalties totaling $518,000 for 94 alleged violations related to the discharge of phenolics, cyanides, oils, soluble iron compounds, acids, and settable solids from eight plants into the Monongahela River. The suit was filed with the Environmental Hearing Board, but its ruling may be challenged in the Commonwealth Supreme Court.

Charges were filed January 12 in the Federal District Court in Pittsburgh by the U.S. Department of Justice for violations of the 1899 Refuse Act. United States Steel was charged with spilling oil from its Homestead Works into the Monongahela River October 28, 1971, and with discharging coal tar from the Clairton Coke Works into Peters Creek June 29, 1971.

During 1972, a two-vessel BOF shop was completed at U.S. Steel's Edgar Thomson-Irvin Works in Braddock. Two electric-arc furnaces and a new wire mill containing eight wire-drawing machines were completed at the Fairless Works from which the first truckload shipment was made in mid-December. The new Fairless mill will concentrate on tonnage markets for bright-basic, hard-drawn mechanical and upholstery spring wire. The new mill replaces U.S. Steel's mill at Worcester, Mass., that was phased out in 1971.

The first heat was tapped January 10 from one of two new 220-ton BOF converters in the No. 5 shop of U.S. Steel's Homestead Works. The shop had five electrostatic precipitators to clean exhaust gases from the BOF converters.

The Wheeling-Pittsburgh Steel Corp. during December started to phase out wire and rod production at its Monessen Works. When completed in mid-1973 the phaseout will eliminate about 200 jobs but will not affect 2,600 other workers at Monessen. Shipments of wire and rod products averaged 49,000 tons annually in the past 5 years, or 76% less than the 207,000 tons shipped in 1955. Most of the tonnage decrease was blamed on imports.

Platinum.—Matthey Bishop, Inc. closed its old platinum refinery in Malvern March 31 but continued the production of platinum and other precious metals in a modern plant in the Malvern Industrial Park.

The Ford Motor Co., Detroit, Mich., signed a 3-year $70 million contract in December with Matthey Bishop for a platinum-based converter system to clean automobile exhaust gases. The contract was expected to supply 30% of Ford's requirements for vehicles to be manufactured in the 1975, 1976, and 1977 model years. Matthey Bishop will build a new facility to produce the honeycomb monolithic type of catalyst. The plant may produce about 2.5 million units per year when full production is attained in 1974.

Rare-Earth Metals.—The Molybdenum Corp. of America (Molycorp) operated rare-earth and cerium processing facilities in Washington and York. The York plant also produced lanthanum chloride. The consumption of cerium, the most abundant rare earth, continued to increase because about one-quarter of the U.S. flint glass container manufacturing plants used a new cerium decolorizing process to obtain a water-white transparency and to reduce the passage of harmful ultraviolet radiation into glass containers. The use of 3 ounces of cerium compounds per ton of glass produced reportedly reduced glass decolorizing costs by as much as 50%.

Molycorp and Alcoa formed a new company, Rare Earth Metals Co. of America

(Remcoa), to be 49% owned by Molycorp and 51% by Alcoa, to help meet the increasing demand for rare earth metals. Remcoa planned to construct a pilot electrolytic cell at Washington to produce misch metal, a mixture of rare-earth metals, the sales of which were to start in 1973. By 1974, Remcoa expected to have a full-scale plant in operation at a site to be chosen in early 1973.

Zinc.—The State's production of primary zinc came from the underground Friedensville mine, near Bethlehem, where a zinc sulfide replacement ore body in dolomitic limestone was mined by the open stope and room and pillar methods. Reserves were estimated August 1, 1966, at 5,332,818 tons of proven ore, averaging 6.5% zinc, and 13,023,250 tons of probable ore, averaging 6.7% zinc. The deposit has not been delimited according to a Gulf & Western Industries Inc. statement to shareholders. Zinc production was 33.2% less and its value was 26.3% less than in 1971, principally owing to ground subsidence problems and floodwaters from tropical storm Agne

The New Jersey Zinc Co., a subsidiary c Gulf & Western Industries Inc,, adde 4,000 tons annual zinc capacity at its Pa merton plant.

New Jersey Zinc Co. received a $135,84 grant from EPA to evaluate a process t recover sulfuric acid from liquid wast from the company's Gloucester, N.J. plan The grant will terminate in June 197 The process will be tested in a $250,00 pilot plant at the company's Palmerto works.

Zinc concentrates from the St. Joe Miner Corp. Balmat-Edwards mining complex i northern New York were processed at th corporation's Josephtown electrothermi smelter at Monaca. The smelter has a annual capacity of 210,000 tons of sla zinc and 35,000 tons of zinc oxide. Approx mately three-fourths of the total sulfuri acid produced by the New Jersey Zinc C at Palmerton and St. Joseph Lead Co. a Josephtown was consumed by the producer

Table 28.—Principal producers

Commodity and company	Address	Type of activity	County
Abrasives:			
Nonmetallic: Satellite Alloy Corp.	9800 McKnight Rd. Pittsburgh, Pa. 15237	Plant	Allegheny.
Metallic:			
Abrasive Metals Co	26th and B. & O. RR Pittsburgh, Pa. 15222	do	Do.
Durasteel Abrasive Co	2601 Smallman St. Pittsburgh, Pa. 15222	do	Westmoreland.
Pangborn Div., the Carborundum Co.	Box 380 Hagerstown, Md. 21740	do	Butler.
Cement:			
Allentown Cement, Div., National Gypsum Co.[1]	7th St. at Thruway Allentown, Pa. 18101	do	Berks.
Allentown Cement, Div., National Gypsum Co.	do	do	Montgomery.
Bessemer Cement Co., subsidiary of Louisville Cement Co.	510 Hanna Bldg. Cleveland, Ohio 44115	do	Lawrence.
Coplay Cement Mfg. Co[1]	North 2d St. Coplay, Pa. 18037	do	Lehigh.
Do	Easton Rd. Coplay, Pa. 18037	do	Northampton.
G & W. H. Corson, Inc	Plymouth Meeting, Pa. 19462	do	Montgomery.
Martin Marietta Cement[1]	Box 5618 Baltimore, Md. 21210	do	Northampton.
Green Bag Cement Co., Div. of Marquette Cement Manufacturing Co.	20 North Wacker Dr. Chicago, Ill. 60606	do	Allegheny.
Hercules Cement Co., Div. of Amcord Inc.	1770 Bathgate Rd. Bethlehem, Pa. 18018	do	Northampton.
Keystone Portland Cement Co.[1]	2200 Hamilton St. Allentown, Pa. 18105	do	Do.
Lone Star Cement Corp[1]	Box 6237 West End Br. Richmond, Va. 23230	do	Do.
Medusa Portland Cement Co.[2]	Box 5668 Cleveland, Ohio 44101	do	Lawrence.
Medusa Portland Cement Co.[3 4]	do	do	York.
National Portland Cement Co.[1]	1023 West St. George Ave. Linden, N.J. 07036	do	Northampton.
Penn-Dixie Cement Corp[5]	Box 152 Nazareth, Pa. 18064	do	Butler.

See footnotes at end of table

Table 28.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
nent—Continued			
Penn-Dixie Cement Corp [1]	Box 152 Nazareth, Pa. 18064	Plant	Northampton.
Universal Atlas Cement Div., U.S. Steel Corp.	600 Grant St. U.S. Steel Bldg. Pittsburgh, Pa. 15230	----do	Allegheny.
Universal Atlas Cement Div., U.S. Steel Corp.[1]	----do	----do	Northampton.
Whitehall Cement Manufacturing Co.[1]	123 South Broad St. Philadelphia, Pa. 19109	----do	Lehigh.
y and shale:			
Fire:			
Drexel Refractories Div., Drexel Dynamics Corp.	Box 50 Kittanning, Pa. 16201	Underground	Armstrong.
Freeport Brick Co., Kittanning Brick Div.	R.D. 1 Adrian, Pa. 16120	----do	Do.
Harbison Walker Refractories.	2 Gateway Center Pittsburgh, Pa. 15222	Pits	Cambria, Centre, Clearfield, Fayette, Somerset.
Clearfield Clay Prod. Co	Box 1110 Clearfield, Pa. 16830	3 mines	Clearfield.
Reese Brothers	Houtzdale, Pa. 16651	2 mines	Do.
Ralph A. Veon, Inc	Darlington, Pa. 16115	Pit	Lawrence.
Common clay and shale:			
Bylite Corp	Box 1628 North End Station Wilkes-Barre, Pa. 18705	Pit	Luzerne.
Glen-Gery Corp	227 North 5th St. Reading, Pa. 19601	Pit	Berks, Northumberland, Union, York.
Hanley Co	28 Kennedy St. Bradford, Pa. 16701	Pit	McKean and Jefferson.
McAvoy Vitrified Brick Co.	Phoenixville, Pa. 19460	Pit	Chester.
McQuiston Coal Co [6]	109 East Moody Ave. New Castle, Pa. 16101	Pit	Lawrence.
Milliken Brick Co., Inc	2100 Montier St. Pittsburgh, Pa. 15221	Pit	Allegheny.
al:			
Anthracite:			
Blue Coal Corp [4]	101 South Main St. Ashley, Pa. 18706	Underground	Luzerne.
Blue Coal Corp [7]	----do	Culm bank	Do.
Blue Coal Corp [8]	----do	Strip	Do.
Gilberton Coal Co	Gilberton, Pa 17934	Culm bank	Northumberland.
Glen-Nan Coal Co., Inc	St. Mary's and River Rd. Wilkes-Barre, Pa. 18702	Underground	Luzerne.
Greenwood Stripping Corp.	1 Venice St. Nesquehoning, Pa. 18240	Strip	Carbon, Schuylkill.
Jeddo-Highland Coal Co.[3]	800 Exeter Ave. West Pittston, Pa. 18643	----do	Luzerne.
Jeddo-Highland Coal Co.[4]	----do	Culm bank	Do.
Kerris & Helfrick, Inc	Lehigh and Popular St. Mount Carmel, Pa. 18751	Strip	Columbia, Northumberland, Schuylkill.
Leon E. Kocher Coal Co	Box 127 Valley View, Pa. 17983	Underground	Schuylkill.
Lehigh Valley Anthracite, Inc.	800 Exeter Ave. West Pittston, Pa. 18653	Culm bank	Carbon, Schuylkill, Luzerne.
Do	----do	Strip	Columbia, Luzerne, Schuylkill.
Reading Anthracite Co	200 Mahantongo St. Pottsville, Pa. 17901	Culm bank	Northumberland, Schuylkill.
Do	----do	Strip	Do.
Bituminous:			
Barnes & Tucker Co	357 Lancaster Ave. Haverford, Pa. 19041	Underground	Cambria.
Bethlehem Mines Corp	701 East 3d St. Bethlehem, Pa. 18016	----do	Cambria, Washington.
Buckeye Coal Co	Box 900 Youngstown, Ohio 44501	----do	Greene.
Gateway Coal Co., for J & L Steel Corp.	Box 608 California, Pa. 15419	----do	Do.
Harmar Coal Co [4]	Box 500 Library, Pa. 15129	----do	Allegheny.

See footnotes at end of table

Table 28.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Coal—Continued			
Bituminous—Continued			
Jones & Laughlin Steel Corp.	Box 608 California, Pa. 15419	Underground	Greene.
Mathies Coal Co	Box 500 Library, Pa. 15129	----do----	Washington.
Pittsburgh Coal Co [4]	----do----	----do----	Do.
United States Steel Corp.	525 Wm. Penn Pl. Pittsburgh, Pa. 15219	----do----	Do.
Graphite (synthetic):			
Airco Speer Carbon Products, Div. of Air Reduction Co., Inc.	Theresia St. St. Marys, Pa. 15857	Plant	Elk.
Chas. Pfizer & Co., Inc. MPM Division.	235 East 42d St. New York, N.Y. 10017	----do----	Northampton.
Stackpole Carbon Co	St. Marys, Pa. 15857	----do----	Elk.
Gypsum (calcined): United States Gypsum Co.[9]	101 South Wacker Dr. Chicago, Ill. 60606	----do----	Philadelphia.
Iron ore:			
Bethlehem Mines Corp [10]	701 East 3d St. Bethlehem, Pa. 18016	Underground	Berks.
Bethlehem Mines Corp [11]	----do----	----do----	Lebanon.
Iron oxide pigments:			
Crude:			
Allegheny Ludlum Steel Corp.	2000 Oliver Bldg. Pittsburgh, Pa. 15222	Plant	Allegheny.
Lanzendorfer Minerals Co.	Twin Rocks, Pa. 15960	Pit	Cambria.
Finished:			
Minerals, Pigments & Metals Div., Chas. Pfizer & Co., Inc.	640 North 13th St. Easton, Pa. 18042	Plant	Northampton.
The Prince Manufacturing Co.	Bowmanstown, Pa. 18030	----do----	Carbon.
Reichard-Coulston, Inc.	15 East 26th St. New York, N.Y. 10010	----do----	Northampton.
Lime:			
The J. E. Baker Co [1]	Box 1189 York, Pa. 17405	----do----	York.
Mercer Lime & Stone Co	1640 Oliver Bldg. Pittsburgh, Pa. 15222	----do----	Butler.
National Gypsum Co [1]	325 Delaware Ave. Buffalo, N.Y. 14202	----do----	Centre.
Warner Co [1]	1721 Arch St. Philadelphia, Pa. 19103	----do----	Centre, Chester
Mica (crude): Micalith Mining Co., Inc.	Box 16148 Phoenix, Ariz. 85001	Pit	York.
Peat:			
Benton Peat	Benton, Pa. 17814	Bog	Columbia.
Blue Ridge Industries, Inc.	Box 128, R.D. 2 White Haven, Pa. 18661	Bog	Luzerne.
D.M. Boyd Co	226 Francis St. New Wilmington, Pa. 16142	Bog	Lawrence.
Corry Peat Products Co	515 West Columbus Ave. Corry, Pa. 16407	Bog	Erie.
International Peat, Inc	R.D. 1 White Haven, Pa. 18661	Bog	Luzerne.
Lake Benton Peat Moss	1418 North Main St. Scranton, Pa. 18508	Bog	Lackawanna.
Pennsylvania Peat Moss, Inc.	21st and Laurel Sts. Hazleton, Pa. 18201	Bog	Luzerne, Monroe.
Stillers Blue Ridge Peat Co	R.D. 1 White Haven, Pa. 18661	Bog	Luzerne.
Perlite (expanded):			
Armstrong Cork Co	Lancaster, Pa. 17603	Plant	Lancaster.
Atlantic Perlite	Box 345 Primose, Pa. 19018	----do----	Delaware.
Pennsylvania Perlite Corp	Box 2002 Lehigh Valley, Pa. 18001	----do----	Lehigh, York.
Perlite Manufacturing Co	Box 478 Carnegie, Pa. 15106	----do----	Allegheny.
U.S. Gypsum Co	101 South Wacker Dr. Chicago, Ill. 60606	----do----	Philadelphia.
Petroleum refineries:			
Atlantic Richfield Co	260 South Broad St. Philadelphia, Pa. 19102	----do----	Do.
BP Oil Corp	600 Fifth Ave. New York, N.Y. 10001	----do----	Delaware.
Gulf Oil Corp	Box 7408 Philadelphia, Pa. 19101	----do----	Erie.
Kendall Refining Co., Div. of Witco Chemical Co.	Bradford, Pa. 16701	----do----	McKean.
Pennzoil United, Inc	Oil City, Pa. 16301	----do----	Venango.

See footnotes at end of table.

Table 28.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
oleum refineries—ntinued			
Quaker State Oil Refining Corp.	Farmers Valley, Pa. 16749	Plant	McKean, Venango.
Sun Oil Co	1608 Walnut St. Philadelphia, Pa. 19101	do	Do.
United Refining Co	Warren, Pa. 16365	do	Warren.
Valvoline Oil Co., Div. of Ashland Oil and Refining Co.	Freedom, Pa. 15042	do	Beaver.
Wolf's Head Oil Refining Co., Inc.	Reno, Pa. 16343	do	Venango.
l and gravel:			
Davison Sand & Gravel Co	34th Ave. and 4th St. New Kensington, Pa. 15068	Dredge	Westmoreland.
Dravo Corp. Keystone	One Oliver Plaza Pittsburgh, Pa. 15222	do	Beaver.
Erie Sand Steamship Co	Erie, Pa. 16500	do	Erie.
Haudaille Constr. Materials Inc.	10 Park Place Morristown, N.J. 07960	Pit	Northampton.
Lycoming Silica Sand Co	401 Broad St., Box 159 Montoursville, Pa. 17754	Pit	Lycoming.
Mahoning Valley Sand Co	Box 1236 New Castle, Pa. 16102	Pit and plant	Lawrence.
Pennsylvania Glass Sand Corp.	Berkeley Springs, W. Va. 25411	Pit	Huntingdon, Mifflin, Venango.
Pennsy Supply, Inc	1001 Paxton St. Harrisburg, Pa. 17104	Pit	Perry.
Warner Co	1721 Arch St. Philadelphia, Pa. 19103	Pit	Bucks.
Wyoming Sand and Stone Co.	Falls, Pa. 18615	Pit	Wyoming.
ters:			
The New Jersey Zinc Co	Palmerton, Pa. 18071	Plant	Carbon.
St. Joe Minerals Corp	Josephtown, Pa. 15061	do	Beaver.
e:			
Limestone and dolomite—crushed:			
Appalachian Stone Div., Martin-Marietta Corp.	Box 120 Mercersburg, Pa. 17236	Quarry	Centre, Chester, Fayette, Franklin.
Bethlehem Mines Corp.	701 East 3rd St. Bethlehem, Pa. 18016	do	Adams.
Do	do	do	Mifflin, Montgomery, Northampton.
Bradford Hills Quarries, Inc.	Box 231 Easton, Pa. 18042	do	Chester, Lancaster, Perry.
G. & W. H. Corson, Inc.[12]	Plymouth Meeting, Pa. 19462	do	Montgomery.
Eureka Stone Quarry, Inc.	Lower State and Pickertown Rds. Eureka, Pa. 18914	do	Bucks.
Eastern Industries, Inc	Box 188 Wescosville, Pa. 18090	do	Berks, Lehigh.
Lycoming Silica Sand Co.	Box 159 Montoursville, Pa. 17754	do	Columbia, Lycoming, Montour.
National Gypsum Co	325 Delaware Ave. Buffalo, N.Y. 14202	do	Berks, Centre, York.
New Enterprise Stone & Lime.	New Enterprise, Pa. 16664	do	Bedford, Blair, Franklin, Huntingdon.
United States Steel Corp.	Hillsville, Pa. 16132	do	Lawrence.
Miscellaneous—crushed and broken: Gill Quarries, Inc.	Box 187 Fairview Village, Pa. 19434	do	Montgomery.
Sandstone and quartzite—crushed:			
American Asphalt Paving Co	Box 95, R.D. 5 Shavertown, Pa. 18700	do	Luzerne.
Coolbaugh Sand & Stone, Inc.	32 Railroad Ave. Scranton, Pa. 18505	do	Do.
Faylor Middlecreek, Inc.	Winfield, Pa. 17889	do	Dauphin, Northampton.
Keeler Supply Co., Inc.	Box 12 Clifford, Pa. 18413	do	Susquehanna.
Latrobe Construction Co	Box 150 Latrobe, Pa. 15650	Underground	Westmoreland.
No. 1 Contracting Corp. of Delaware.	Box 460 Pittston, Pa. 18640	Quarry	Northampton, Schuylkill.
Summit Quarries, Div. of J. Robert Bazley, Inc.	Box 298 Pottsville, Pa. 17901	do	Schuylkill.

e footnotes at end of table.

Table 28.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Stone—Continued			
Sandstone and quartzite—dimension:			
Delaware Quarries	Lumberville, Pa. 18933	Quarry	Bucks.
Firestone Products Co., Inc.	300 Willow Grove Ave. Glenside, Pa. 19038	----do	Montgomery
Media Quarry Co	131 East 2d St. Media, Pa. 19063	----do	Delaware.
Slate—dimension:			
Anthony Dally & Sons, Inc.	Robinson Ave. Pen Argyl, Pa. 18072	----do	Northampto
Doney Slate Co	Pen Argyl, Pa. 18072	----do	Do.
Emerald Slate Corp	Alpha Road Wind Gap, Pa. 18091	----do	Do.
North Bangor Slate Co.	Bangor, Pa. 18013	----do	Do.
Penn Big Bed Slate Co., Inc.	446 Main St. Slatington, Pa. 18080	----do	Lehigh.
Stephens-Jackson Co	Main St. and Schanck Ave. Pen Argyl, Pa. 18072	----do	Northampto
D. Stoddard & Sons, Inc	Bangor, Pa. 18013	----do	Do.
Traprock (basalt)—crushed and broken:			
Bucks County Crushed Stone, Inc.	Ottsville, Pa. 18952	----do	Bucks.
V. Di Francesco & Sons	17 Mifflin Ave. Havertown, Pa. 19083	----do	Chester.
Do	----do	----do	Delaware.
The General Crushed Stone Co.	712 Drake Bldg. Easton, Pa. 18042	----do	Bucks, Delaware.
Kibblehouse Quarries, Inc.	Perkiomenville, Pa. 18074	----do	Montgomery
Pottstown Trap Rock Quarries, Inc.	R.D. 1 Douglasville, Pa. 19518	----do	Berks, Montogem
Warner Co	1721 Arch St. Philadelphia, Pa. 19103	----do	Berks.
Traprock (basalt)—dimension:			
Coopersburg Granite Co	Coopersburg, Pa. 18036	----do	Bucks.
Granite—crushed:			
Mignatti Construction Co., Inc.	2310 Terwood Ave. Bethayres, Pa. 19006	----do	Montgomery
Sulfur:			
Atlantic Richfield Co	3144 Passyunk Ave. Philadelphia, Pa. 19145	Plant	Philadelphia
Gulf Oil Corp	Box 7408 Philadelphia, Pa. 19101	----do	Do.
BP Oil Corp., Subsidiary of British Petroleum Corp., Ltd.	Box 428 Marcus Hook, Pa. 19061	----do	Delaware.
Sun Oil Co	1608 Walnut St. Philadelphia, Pa. 19103	----do	Do.
Tripoli (rottenstone):			
Keystone Filler & Manufacturing Co.	Muncy, Pa. 17756	Pit	Lycoming.
Penn Paint & Filler Co	Antes Fort, Pa. 17720	Pit	Do.
Vermiculite (exfoliated):			
Hyzer & Lewellen	Box 155 Southhampton, Pa. 18966	Plant	Bucks.
W. R. Grace & Company, Construction Prod. Div.	62 Whittemore Ave. Cambridge, Mass. 02140	----do	Lawrence.

[1] Also limestone.
[2] Also limestone and shale.
[3] Also limestone and clay.
[4] 2 operations.
[5] Also limestone and sand and gravel.
[6] Also fire clay.
[7] 3 operations.
[8] 4 operations.
[9] Also expanded perlite.
[10] Also byproduct cobalt and pyrites.
[11] Also byproduct gold, silver, copper, cobalt, and pyrites.
[12] Also lime.

☆ U.S. Government Printing Office: 1975—543-488